ISSN 0310-222X

EARTH GARDEN

10

-natural living and growing

- THE SEED PRIMER
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- START WITH HENS
- SOLAR HEATERS
- ORGANIC TOMATOES
- WATERS OF LIFE
- HYDRAULIC RAM
- HOMESTEAD DAM
- WATER WHEELS
- A MILLER'S TALE

PLUS: SOFT TECHNOLOGY, COMTEK, THE HUMAN UNIT

No 11

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MARCH, 1975

AUTUMN

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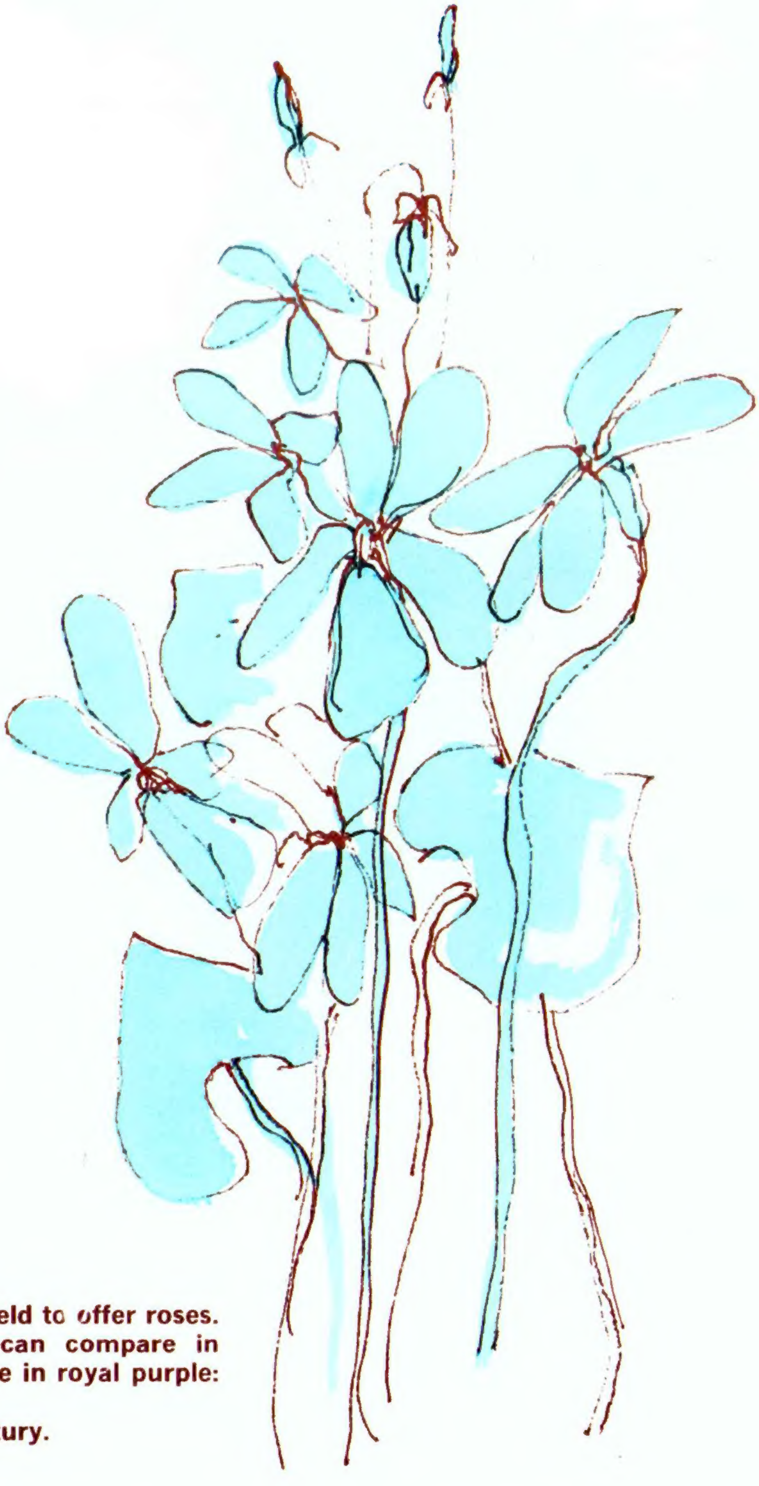
OF VIOLETS



When daises pied, and violets blue,
And lady-smocks all silver-white,
And cuckoo-buds of yellow hue,
Do paint the meadows with delight . . .
LOVE'S LABOUR'S LOST, Act V, Scene 2

The forward violet thus did I chide —
Sweet thief, whence didst thou steal the sweet that smells
If not from my love's breath? The purple pride
Which on thy soft cheek for complexion dwells
In my love's veins thou hast too grossly dy'd.
SONNET XCIX

— I would give you some violets, but they withered all when my father died . . .
Ophelia, HAMLET, Act IV, Scene 5

To gild refined gold, to paint the lily,
To throw a perfume on the violet . . .
Is wasteful and ridiculus excess.
KING JOHN, Act IV, Scene 2

I know a bank where the wild thyme blows,
Where oxlips and the nodding violet grows.
A MIDSUMMER NIGHT'S DREAM, Act II, Scene 1

WILLIAM SHAKESPEARE, 1564-1616

He who offers violets must in love be held to offer roses. Of all the fragrant herbs I send none can compare in nobleness with the purple violet. They shine in royal purple: perfume and beauty unite in their petals.
BISHOP FORTUNATUS, Latin poem, 6th Century.

That which above all others yields the sweetest smell is the violet.
FRANCIS BACON, Of Gardens, 1625.

EARTH GARDEN No.11

EARTH GARDEN presents a range of natural lifestyles. It is intended as a key to sources, practical ideas, alternatives and self-sufficiency.

EARTH GARDEN is concerned with non-polluted living and growing, the back-to-the-earth movement, surviving in the city, the bush, food and diet and the inner changes which follow when you are in tune with Nature.

Let us lead you up EARTH GARDEN's path to the good life.

There are still no advertisements in EARTH GARDEN. Books, places and products recommended are those we think relevant.

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THE COVER: Two men in a hand-operated paddle-wheel boat, from the engineering sketches of the Anonymous Hussite, about 1430.

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It can work for you

"Trying to get some money together to move to the country" — how many times have I heard these words in the last few years? And generally, when I see the people again, they're still saying them.

Well, my advice to you is — get out and do it. It worked for me and, unless I've been phenomenally lucky, I don't see why it couldn't work for you.

I left Sydney with several other people almost three years ago now, bound for a farm I hadn't seen — only heard about third hand — without even enough money for petrol home. We loved the place at first sight and moved in a few days later.

We still rent the house, with three acres around it, for $30 a month; while the owner runs a few cattle on the rest of the 60 acres. We're never likely to have enough money to buy the farm, though we have first option if the owner ever decides to sell.

The house looked like a burnt-out cave when we first saw it. It's half mud (wattle-and-daub) and half fibro and corrugated iron, with a two-roomed log cabin attached.

We gradually rebuilt three of the four mud-walled rooms — using clay dug from a creek bed at the back of our place — and whitewashed the walls. Floors were repaired with offcuts from the local sawmill.

With the aid of a little paint and good ol' seagrass matting (virtually our only financial outlay) the house became bright and habitable. Since then, Russell has built a bathroom (the owner paid for that) and we now enjoy the enormous luxury of running cold and hot water in the kitchen — a necessity with the advent of our daughter, Kristy.

Along the way — we've accumulated (bought, traded or been given) seemingly dozens of animals, ranging from our Jersey cow to numerous cats. And waged annual battles for our vegetable crops against goats, ducks, and a ridiculously short growing season.

Gypsy the house cow gives us six pints of milk each morning, and we let the calf drink during the day and separate them each night. We appreciate her milk, especially now that our milking goat Nanny hasn't been kidded for some time.

Russell works when we need money and stops when it gets him down. We don't slave at the farming life 12 hours a day — there are too many other things to be done. We just do enough to keep everything running reasonably smoothly (although I suspect the animals could run it just as well by themselves).

I guess it sounds very simple when I put it down on paper, but maybe I could suggest a few ideas for those who aren't sure where to start ... go to meetings and seminars that are related to country living. This place was first offered at a seminar on communal living at Glenfield Farm, NSW.

If possible, get a vehicle for a few weeks and go to the district where you think you'd like to live. Visit stock and station agents, talk to the locals and, most importantly, keep your eyes open. There are always old, empty houses which neighbours will be able to tell you about (who the owners are etc).

If the thought of renting gets you down, save money to buy the place while you're living in it. At least you will have escaped the city treadmill. You'll be enjoying your farm while you're working to have it for yourself.

Anyhow good luck, and good hunting.

ROBYN, RUSSELL & KRISTY

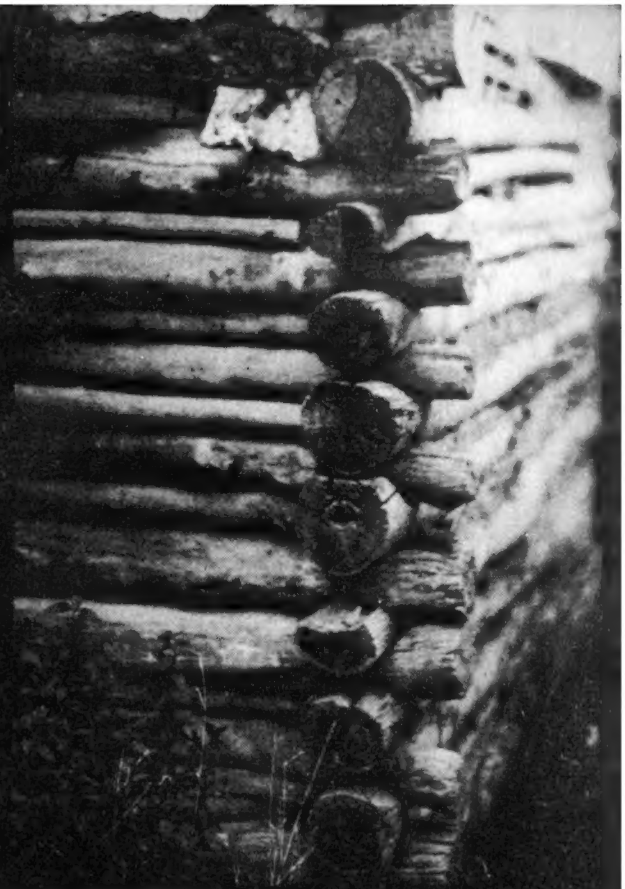
Russell brings home Gypsy for the night.

PHOTOS AT RIGHT: Top left — Robyn, Russell and Kristy outside their country cottage.

Top right — Detail of the log cabin addition, chinked with cement, said to have been built by a homesick Canadian.

Bottom — Robyn and Irene with Kristy and Melissa watch the ducks. The kids are about the same age and have become good playmates.

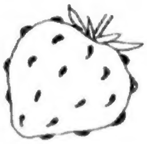
Photos by Keith.



FRUITS

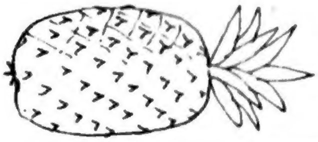
AGGREGATE:

Strawberry



MULTIPLE:

Pineapple



FRUITS:

1. SIMPLE

2. AGGREGATE
Strawberry
Blackberry

3. MULTIPLE
Pineapple

DRY

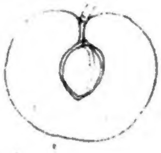
FLESHY
(a) Drupe: Cherry, Plum etc.
(b) Berry: Tomato, Cucumber.
(c) Hesperidium: Citrus.
(d) Pome: Apple, Pear.

DEHISCENT (SPLIT)
(a) Pod (Legume): Beans, Peas.
(b) Follicle: Banksia, Grevillea, Hakea.
(c) Siliqua + Silicula: Stock, Honesty.
(d) Capsule: Eucalyptus, Liquidambar.

INDEHISCENT (DON'T SPLIT)
(a) Nut: Hazelnut, Acorn.
(b) Achene: Sunflower.
(c) Caryopsis: Grains.
(d) Samara: Maple, Ash.
(e) Cypsela: Clematis, Thistle.

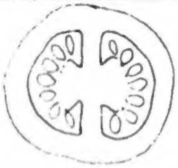
FLESHY – DRUPE:

Cherry



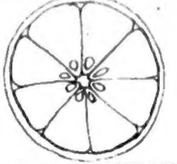
BERRY:

Tomato



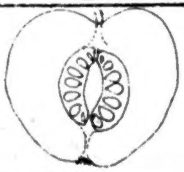
HESPERIDIUM:

Orange.



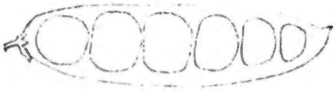
POME:

Apple



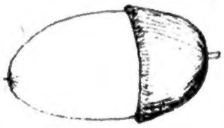
DEHISCENT – LEGUME:

Pea



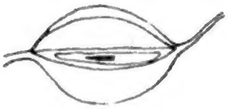
INDEHISCENT – NUT:

Acorn



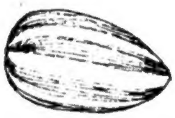
FOLLICLE:

Grevillea



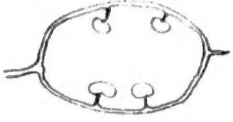
ACHENE:

Sunflower



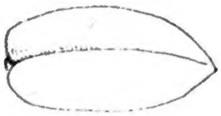
SILICULA:

Honesty



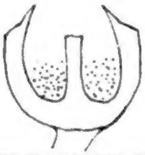
CARYOPSIS:

Wheat



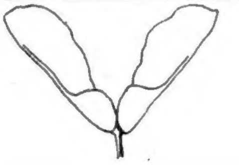
CAPSULE:

Eucalyptus



SAMARA:

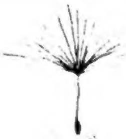
Maple



DRAWINGS: TERRY FREY

CYPSELA:

Thistle



TF.

The Seed Primer

BY TONY TYRREL

What is a seed?

Technically a seed is the product of a fertilised ovule, consisting of an embryo enclosed by a protective seed coat. It is a young undeveloped plant with a food source. Many of what we know as "seeds" are in fact fruit.

Fruit and their seeds fall into several classifications. A knowledge of these types is useful when extracting or planting seeds. It is easy to plant a small hard fruit thinking it is a seed!

The diagram and drawings opposite show these different fruit types.

Extraction and Collection

All seed collection depends upon a knowledge of the best time to take the seeds. Seeds are best left to mature on the plant. It is important that you know just when the seeds are ripe and that you can judge your collection before the seeds are naturally dispersed.

Some general rules can be applied:

Fleshy fruits, such as peaches, plums, tomatoes and cucumbers are harvested as the flesh becomes soft enough to mash to facilitate seed extraction. Seeds should be sown as soon as possible so that the seed coat doesn't harden.

Capsular and pod fruits will change colour as they ripen. Careful timing is important as seeds harvested too early will be immature and if left too long the fruit may split and disperse the seeds, for example, peas and beans etc.

In winged seed it is fairly easy to detect when the seeds are about to disperse.

Various techniques are used when extracting seeds. In fleshy fruits, such as tomatoes and citrus, seeds can be extracted by these methods:

1. Fermentation. The ripe fruits are mashed and placed in jars to ferment. If 60-80 degrees F can be maintained and the mass occasionally stirred the good seeds will sink to the bottom and can be removed and washed.
2. Forcing the pulp through a fine sieve may separate the seeds.
3. Flotation. The pulped fruit is shaken vigorously in water; the heavier seeds again settling.

In capsular and pod fruits the ripe fruits should be placed in a warm, dry place (a sunny window sill is ideal) until the fruit opens.

In winged seeds it is often best to remove the wings and stalks etc before sowing. In the vegetable patch you can often catch maturing seed by placing a paper bag over the maturing seed as it ripens. This allows the seed to mature fully and be easily collected.

Storage

Storage conditions may affect the length of seed life (or viability). Seeds respire and use up stored food, so they should be kept at conditions of temperature and moisture that minimise the seeds' activity. Dry and cool are the two requirements. You are also less likely to be bothered by fungus attack if you have these conditions.

Don't store seed in plastic. Paper bags or loosely-sealed jars are ideal.

It is best to plant fresh seed.

Some seeds live for hundreds of years and some for only a few days. In general apply these rules for seed handling:

1. Collect mature seeds from healthy, vigorous, disease-free plants.
2. Store in a cool (30-40 deg F) dry place (less than five per cent moisture in the seeds and less than 60 per cent humidity).

Germination

Some seeds can be planted directly in your garden if conditions are favourable. Some can be grown in punnets and then planted out, either as you need them or when the climatic conditions are right. Whichever method you are using seeds all require the same basic conditions for germination.

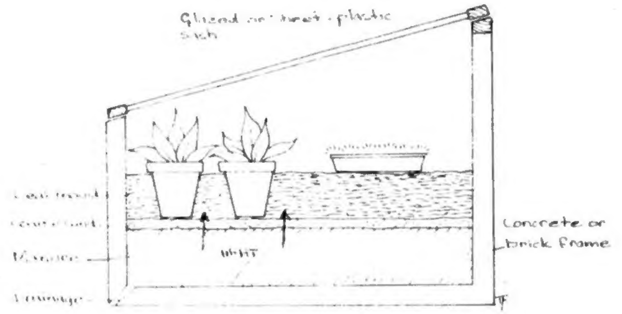
Firstly, the seeds must be viable and capable of germinating. Secondly, the seeds require water. The seeds must absorb water before they begin to grow . . . think how much beans expand when soaked before cooking.

Thirdly, the seeds need favourable temperatures and requirements vary from seed to seed. You will know from experience in your own garden. Some vegetables will germinate in winter, for example onions 2 deg C to 27 deg C, parsnips 2 deg C to 21 deg C, while some need higher temperatures, for example sweet corn 10 deg C to 30 deg C and capsicum 15 deg C to 30 deg C.

Many vegetable books will tell you ideal germinating temperatures. Better Vegetables by Norman de Vaus, has such information.

Fourthly, the seed needs oxygen. This may seem an unlikely requirement to lack, but if you keep your seed mix or soil too wet then no oxygen will be able to reach the seeds. Light is not necessary until the shoot reaches soil level and the little plant begins to manufacture food.

SIMPLE HOT-BED



Most of the seedlings we grow are produced in a seed tray under artificial light, in a hot-bed or in a seed-bed. We start early summer vegetables inside in the tray or outside in the hot-bed, and then use the outdoor seed-bed in spring and summer.

Once the weather has really warmed up we plant directly into the ground. Some vegetables transplant badly and thus necessitate direct planting, such as carrots, eggplants and celery. Peat pots can be a very good way of solving this problem. They are small pots made of peat moss that you fill with soil. They can be planted as is without disturbing the roots.

We grow eggplants, melons, tomatoes, and many flowers this way. ("Jiffy" pots are also suitable as are old cardboard egg cartons.) Our outside seed-bed is simply a section of the garden that is sheltered and that can be worked into a fine tilth. You need a fine, well-worked soil for seedlings.

Depending on the quantity of seedlings you want you can vary the size of your punnet. We use four inch punnets — the same as you buy vegetables and flower seedlings in at the nursery. There are many other plant containers you can make yourself.

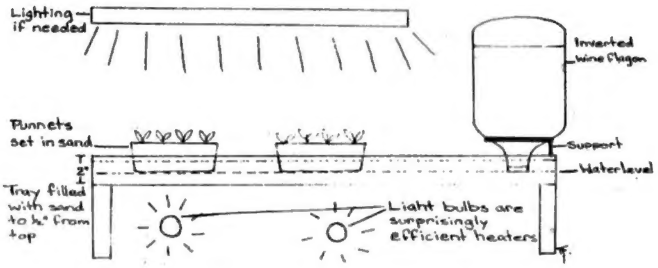
We use a potting mix that is 50-50 sand and vermiculite. The mix must be light enough to allow seed growth, moisture penetration and drainage, and yet be able to hold moisture. Plain washed river sand is also good.

When you sow seeds make sure you sprinkle them evenly over the punnet or tray and then cover them only to the depth of the seed. For instance, if you are sowing a seed that is 1/16th of an inch in diameter, then only sprinkle 1/16th of an inch sand thickness over them. Press the sand down gently.

If you are sowing extremely small seeds a good method of getting an even distribution is to mix the seed with sand and then sow them.

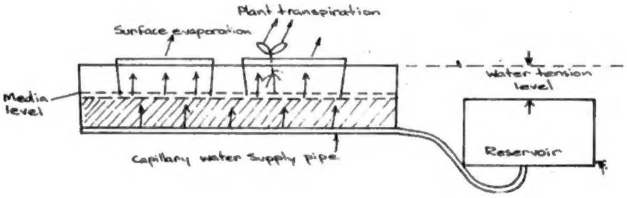
Some seedlings, if sown thinly enough, can be planted out straight from the punnets. Others you may want to grow on until they are easier to handle or the weather warms up. Whatever you do, the seeds cannot be kept growing in your potting mix as it has no plant nutrients. The seedlings must be "pricked out". Pricking out is carried out when the seedling has two-to-four true leaves.

SIMPLE CAPILLARY BENCH


Lighting if needed
Inverted wine flagon
Punnets set in sand
Support
Waterlevel
2"
Tray filled with sand to ½" from top
Light bulbs are surprisingly efficient heaters

NOTES: Set punnets deep for seeds that need much water and shallow for drier types. The wine flagon needs refilling every 2-3 days and will determine your water level. The tray can be plastic, metal or anything that is waterproof. You can be really fancy by installing an old toilet cistern with its water level at the same as the tray's. The inlet pipe can feed in the bottom. You can have a maintenance-free system this way.

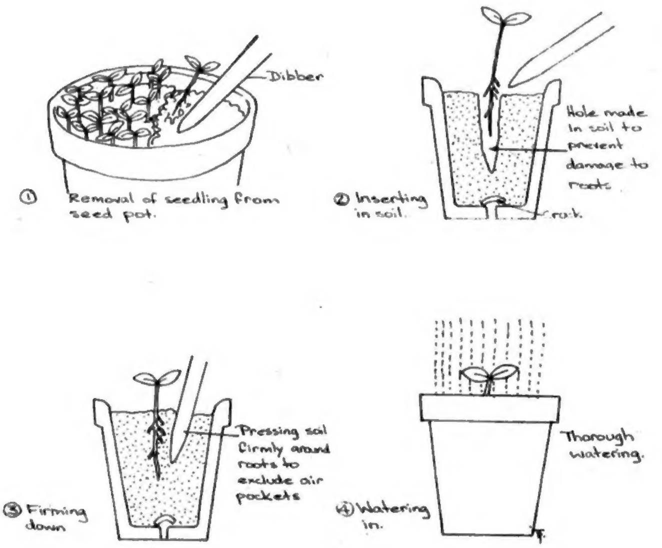
The tray can be kept inside (shed, garage, glasshouse) and can have artificial light or heatings; or can be outside and have sunlight (provided it has some shelter)



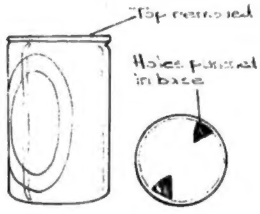
If you are not pricking out directly into your garden then you will have to prepare a soil mix. If you have a good, friable loam then fill your trays with that. If you must make a soil mix make sure it is well-drained yet able to hold water; contains enough plant nutrients (that is, has organic matter); is easy to obtain and is free from diseases or slugs.

Having pricked out your seedlings into punnets or trays water them in well and place them either outside or under cover until you want them. Keep the seedlings moist.

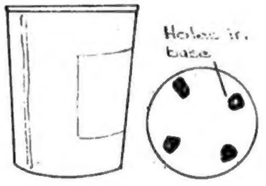
PRICKING-OUT


Dibber
① Removal of seedling from seed pot.
Hole made in soil to prevent damage to roots.
② Inserting in soil.
Crock.
Pressing soil firmly around roots to exclude air pockets
③ Firming down
Thorough watering.
④ Watering in.

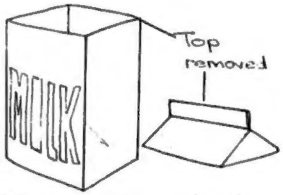
PLANT CONTAINERS



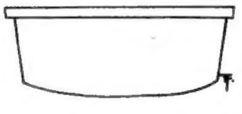
Beer Can



Yoahurt Container



Milk Carton (Holes in base)



Butter tub.

Diseases

Seeds can be attacked by insects or fungus while they are being stored. Prevention by storing them correctly is much, much better than having to use a fungicidal dust or insecticide. Many commercial seeds are treated automatically with fungicides (that pinkish dust on Yates or Hortico seeds).

Once the seeds have germinated the most prevalent disease is "damping-off" — caused by soil inhabiting fungi (Pythium and Rhizoctonia) that attack the young plants. The symptom is a withering of the stem causing the plant to topple and die.

Fungicides can be used, but by following some general rules, you can probably avoid this disease:

1. Treat the seed with fungicide dust, use treated seed, or spray with fungicides. This is a last ditch preventative if damping-off is a real problem.
2. Sterilize your soil (place in an oven at 140 degrees F).
3. Sow seeds thinly so that if you have an outbreak of disease it can be quickly checked by pulling out the dead seedlings.
4. Avoid over watering as this aids the disease spread (ideally use the seed tray illustrated).
5. Avoid over heating for the same reason.
6. Allow free air circulation around the seeds.

These methods **can** be applied with all your seeds, but only **need** to be applied if you have a constant disease problem.

Seeds are an easy means of propagating plants and it is very satisfying to have collected, stored, germinated and grown your own seeds.

If you intend to collect your own seeds there are some points to remember.

Catching seeds in a paper bag.

Only keep seeds from healthy plants.

Don't collect from hybrid plants if you want to reproduce the same plant again ... many modern seeds are the product of hybridizing. This means that two species of a plant, for example, two tomatoes, have been cross-fertilized to produce a new tomato. If you collect the seeds of the new tomato they may turn out to be either one of the parents, or, in fact, sterile.

When you buy your initial tomato seeds (or any other vegetable) ask if they have viable seed. It may not be undesirable to collect from hybrids as both parents may be good varieties ... but then it may. For example some tomatoes have been bred to resist Fusarian wilt — a major disease — and this quality may not be found in the parent plants.

Some seeds may need treating (soaking, chipping, scarifying etc) but these treatments are rarely applicable to vegetables.

Box-bed gardens hark back to the formal "chess-board" plots of Medieval times, like the one shown here. These were raised square or rectangular beds of earth faced with oak boards, bricks, tiles, lead or even sheep shank bones.

Today box-beds are mainly used to produce more vegetables from less space. Set into a lawn, they provide an unexpected growing area in the home garden.

The confined space makes weeding and insect control simple. It is easy to add manure and compost for plant food and to mulch when the vegetables are well-started — about three or four inches high.

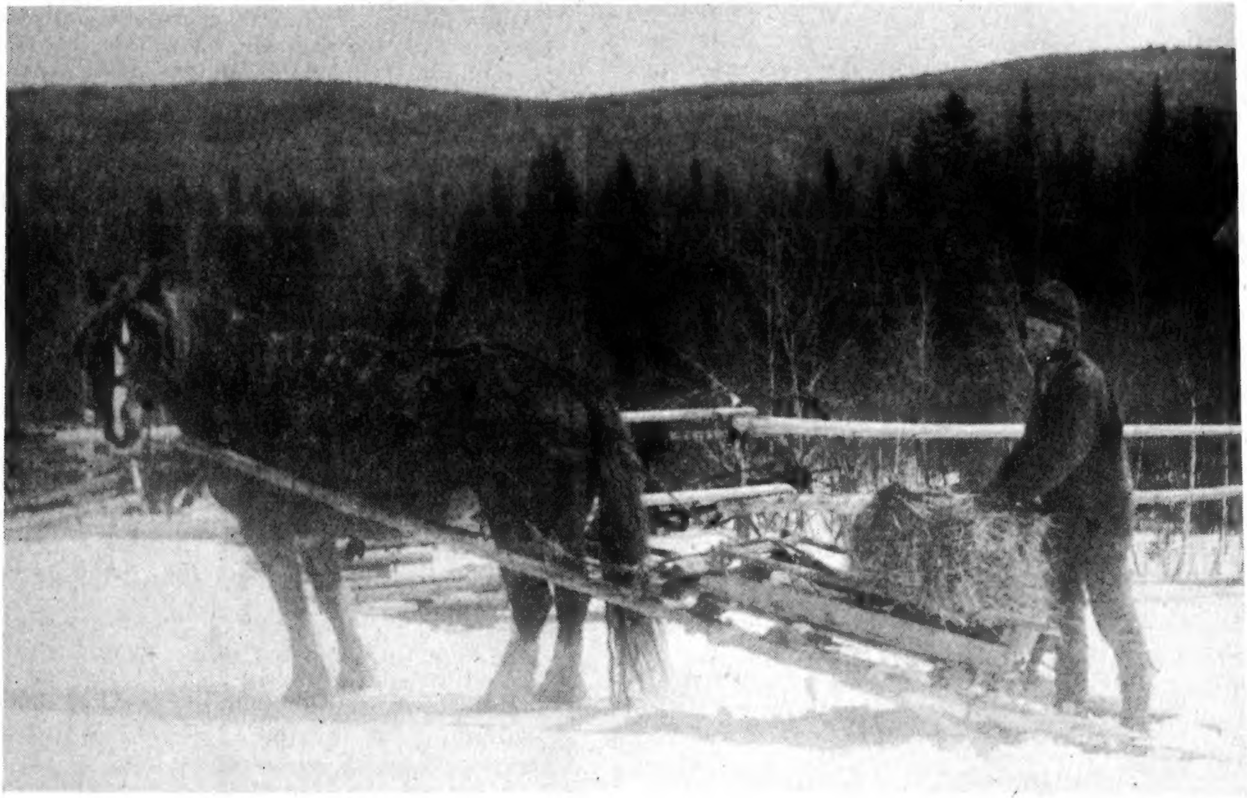
Box-beds are good for starting seedlings and ideal for water-hungry plants like melons, squash and pumpkins, which may be flooded by placing a hose in one corner. Use stones or an old tin to break the force of the water.

Old railway sleepers or wooden planks make the best edges, held in place with wooden pegs or iron spikes at regular intervals. Coat with sump oil (never creasote).

A good sized box-bed would be about six feet long and three feet wide, with a depth of six to ten inches to allow for root growth. Concrete edging may be poured, using boards as formwork. Bricks and tiles will also do the job.

Space plants closer together than in a normal garden. Beans, cabbages, capsicums, tomatoes, squash, melons, silver beet, potatoes and strawberries should all do well in a box-bed.

From Canada a young Australian writes about his experiences in subsistence farming, logging and maple sugaring with a draught mare named Girl.



At home in Quebec

BY GREG WHITTEN

One of our reasons for settling in this part of Quebec was because draught horses are still commonly used here — mostly for wood-cutting and maple sugaring — but also here and there for odd jobs around the farm such as cultivating potatoes and hay-raking.

There are even a few dairy farmers who still use nothing but horses. But, sadly that is going out of style.

Thirty years ago it was all horses here, so it is still easy to find harness and horse-drawn equipment, ploughs, harrows, mowers, rakes, wagons, sleds and so on, in quite good condition.

Our farming is predominantly to provide for ourselves and our animals: the mare, two cows and a few chickens. We farm only about 20 acres of our 100 acres, with about eight acres of hay and grain fields and 12 acres of pasture. The rest is woods. We also make hay elsewhere as our own hay crop is not yet sufficient.

We produce (or gather) as much as we can of our needs — grass, hay, and grain for the animals and grain, potatoes, vegetables, fruit, dry peas and beans, milk with eggs in summer and meat in winter for ourselves. At this point we are 80-90 per cent self-sufficient in food and farm produce.

Our mare is a basic part of our subsistence economy. She helps provide for us and for herself, and helps us earn a small income from maple sugaring and wood-cutting that covers our monetary expenses.

So we are tied in to the cycle of life on our land, as most of the needs for our life here derive from the sun and the soil of nearby fields and forest.

Girl, our mare, is about 1400lbs and eight years old. We have had her for four years now. She was born and raised in Notre Dame des Bois, about 10 miles from here. Girl is a good worker and we get on pretty well, though she gets rather lively at times because we don't have enough steady work for her. So sometimes, after a few days off, she is a bit too quick and excitable for my liking. I generally try to arrange it so that she does some job not too exacting to slow her down before ploughing or yarding logs in the woods, where a slower pace is essential.

I do most of the work with the one horse working single, but for the ploughing and disc-harrowing I usually borrow the mare of our neighbour, Lucien Blais, which matches ours pretty well, and work with a team. This is because these implements are designed for a team. One horse can pull them but they are heavy, and you have to pause a lot to let her catch her breath.

As the other mare is handy and Lucien doesn't work her in summer I generally work double if I have more than ¼-acre to plough or harrow. The other alternative would be to find or rig up a smaller plough and disc-harrow for working single.

Light soil, and moist soil, make it easier for the single horse, while heavy soil, dry soil and sod make it hard. It is often hard to get a single horse to pull the plough slowly enough at first — they tend to want to get a heavy object moving faster and try to trot.

A short-legged horse, or a heavier horse, is more able to plough more slowly. After a while they will get used to it, but perhaps some quicker horses might be pretty difficult to slow down. At first it will take two people, one holding back on the reins and the other holding the plough, but as the horse and the ploughman get the hang of it he can put the reins around his waist.

Ploughing with the horses is very pleasant when it's going smoothly, but it can be tricky and exasperating in heavy sod or rocky soil. With the team I can do up to an acre in a day (this is by no means a record), generally less if there are rocks, sod, or a lot of turning around. Single I get 1/6 to 1/4-acre done in half a day. (It doesn't pay to plough single the whole day as by the afternoon she is too tired and too slow.)

My neighbours say they get better crops with their horses than they do with their tractors.

With horses you tend to plough shallower and they compact the soil less. You can get onto the field earlier in the spring to work it and there is no risk of getting stuck in a wet part of the field in the hay-season as a lot of heavy tractors do here in a rainy summer.

A horse will work and give you manure to help support himself, and so fits in well with a self-sufficient style of living and gives a degree of independence from the vagaries of modern economic and political systems.

A tractor will pay for itself, if you farm enough, but for us it certainly wouldn't. A tractor would be a weight about our necks. Apart from the Freudian thrill of having so much power between the legs I wouldn't enjoy much being seated on two tons of vibrating steel, breathing its fumes and exhaust into my lungs as I went about my daily work.

I prefer to deal with the personality and muscular strength of a horse, and I prefer to smell hay, horse and manure rather than petrol, oil and exhaust, which are all poisonous to some degree (especially petrol, lead tetraethyl and carbon monoxide).

If I'm going to farm organically I want the work to be organic as well as the produce. I don't believe you can operate such a machine without taking in a certain amount of these poisons and without them affecting your health to some extent.

Using them every day one can become insensitive, but if you go for long periods at a time, as we do, without being exposed to the contaminants from internal combustion engines, you would be amazed at how sick and poisoned they can make you feel. And what you don't take in yourself is going out for something else to take in somewhere else. Maybe diluted enough to do no harm, but not always, and who knows? At this stage it is impossible not to produce (and consume) these pollutants, directly and indirectly, but we can at least cut down on our own contribution.

Anyway, a horse runs on grass, hay and grain, all of which can be grown on the average farm. What and how to feed a horse could fill a whole article in itself. One thing I will say is that I tend to feed my horse much less grain than is generally recommended. I grain her only if she is doing regular heavy work or if she is getting under-

New Year's Day, 1975

It is almost seven years now since I left Australia for North America, possessed with that wandering lust many Australians seem to have inherited from their ancestors.

After a few years of searching, experimenting and hard work I find myself with my wife Adrienne and our daughter Dawn on this our farm in the woods of Quebec.

Writing seems to take me a long time. It seems that I have gotten more used to handling an axe or a scythe than a pen. I started this article last winter, but then our daughter was born, the maple sugar season came early, then spring and summer with their rush of work and no spare time.

It is only now, with a foot of snow on the ground, long evenings and my slower paced winter life that I have come to finish it.

By the way, I'm not sure exactly what kind of horse Girl is, but she's a mixture, probably Belgian, maybe some Percheron, with some lighter breed(s) also.

While we love it here, we find ourselves at times considering the possibility of moving to Australia or New Zealand at some time in the near or distant future. This possibility has become more real recently as my parents think they might go back also.

So we wonder if we would be able to set ourselves up again in the Antipodes, with a similar way of life, but with a little more spare time to spend following our interests, with our children, and perhaps less dependence on the fluctuations of the outside world.

At this stage I don't know how serious we are about all this — at least serious enough to look a bit further into the possibilities. It depends on a lot of things.

In peace, Greg Whitten, RR1, Piopolis, P. Quebec, Canada.

weight. Less oats seems to make her quieter.

But I do go to the bother of making good quality hay for her, and she seems to keep in good condition on it. It is no doubt a matter for the individual and his situation, but for us it is easier to put some extra work into hay-making rather than produce a lot of grain (or buy it at today's prices) to supplement poor quality hay.

Girl does the bulk of the heavy work in the hay season. She mows the hay, rakes it, and hauls the wagon in the field while we load it and then hauls it to the barn where we unload it. It takes about 15 tons to winter our animals and supplement our pasture, which is still insufficient. Making hay is not really as simple as it sounds because of the inevitable rain, and our various methods and contrivances to protect (or try to protect) the hay before it is dry enough to put in the barn without it moulding.

In the woods the horse really comes into its own. There has not yet been invented a machine that can do the same work so well and so cheaply (except perhaps his predecessor, the ox).

When I cut down a tree I cut it into logs 10 to 16 feet long and hitch the horse to one end with a chain and yard them up to 50 yards (or more if necessary) to the sled road. This way windfalls, diseased, crowded, damaged or mature trees can be cut selectively for fuel or timber, leaving the rest of the forest undamaged.

With selective cutting the way we practice it only an odd tree here and there is cut, improving conditions for remaining trees, and always leaving a full forest, where you would hardly notice that wood-cutting had been going on.

A forest managed in this way is probably three or four times more productive than clear cutting and far more attractive than the scene of desolation left after the passage of heavy machinery. The horse is light so he doesn't damage the soil and can manoeuvre a log among the trees and obstacles, without hitting them. He can also help bring down a tree that has fallen against another and hung up, by pulling out on its butt — I often need to do that.

In Quebec we get deep snow and cold winters. A horse can still start at 40 degrees F below zero (provided you've kept him in the stable) and make his way through snow up to his belly. Also they are often used in logging operations in swampy areas where a tractor or timberjack would break through the frozen crust, or in rough terrain.

In maple sugaring, Girl is invaluable. In the spring as the trees thaw out a sweet, watery sap will flow from the sugar maple trees. To catch it we drill a small hole in the tree and drive in a metal spout and hang a two-gallon bucket on the spout.

After each frost as the wood thaws out the sap runs. We go through the sugarbrush with the horse and sled with an 80-gallon barrel on it, collect the sap and haul it to the sugarhouse, where we boil it down to make maple syrup. This is something of a luxury item, and it sells for $10 to $20 a gallon.

It is one of the few primary industries where mechanization and capital investment don't pay off. Except in steep locations, where pipes can be installed, the horse and sled are the most efficient way to collect the sap through the deep, slushy, thawing snow.

Girl has learned to follow the made roads in the sugarbrush, and will stop and go and turn left or right when I call to her from a distance, as I go from tree to tree collecting the sap in a bucket and pouring it into the collecting barrel.

A machine with caterpillar traction would cost more to buy and run, you'd have to hire a man to drive it, and it would make you very little extra syrup.

Within 30 miles of us here there may be 10 farms where virtually nothing but horsepower is used — about half of them French-Canadians. The other half are people like us moving back to the land and adopting it as the most practical, economical and ecological way to work the land.

But there are others too who have tried draught horses and not had so much success. I think it is essential to have someone who knows how to do what you're trying to learn and can steer you past the many pitfalls. It can be really dangerous if you don't know what you are doing, for both you and the horse.

We have all had a few hairy experiences and I have been lucky that my accidents were not as serious as they could have been. Now I know better, I hope. You can get into trouble too with an unworkable work-horse. A horse must be sound and he must be workable and dependable.

This depends as much on you as on the horse. He must be of good health and temperament to start with and you must know how to care for him and handle him. You virtually need someone to guide you right from the start.

We were fortunate in that my father had had a lot of experience with horses — he was a horse vet in Australia during the war. He and Micky Fahey, who had worked horses on farms and on the woods in Maine (eastern USA), guided us in selecting a good horse and getting started. And then there were our neighbours, in particular Lucien Blais, who were always there with help and advice when we needed them. I don't know how we would have made it without them.

One thing we have not tried much yet is using Girl for transportation. We've gone up to 10 miles and back in a day, but I'm still afraid to take her into heavy traffic. I don't know what she would do, and I don't know what other people would do.

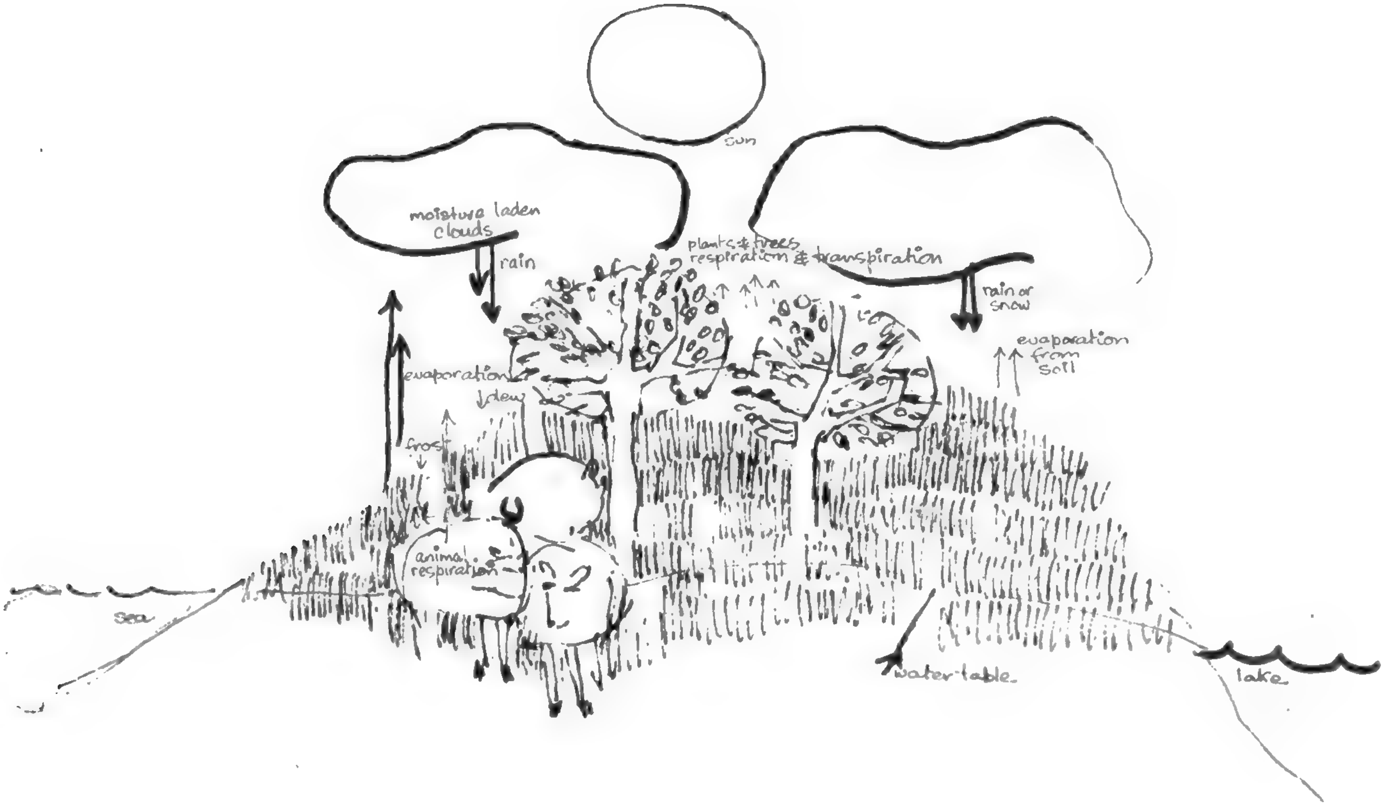
Nobody is expecting to encounter a horse and there are a few mugs on the road who are liable to run into you or run you into the ditch because they don't know any better, or because they think it is sport. A horse and wagon are pretty vulnerable, but it could be done.

We have a friend who last summer drove his horse and buggy about 500 miles to Cape Breton in Novia Scotia over back roads. He really enjoyed it and says next year he's going to British Columbia.

It's probably worth getting used to a slower pace. Motor vehicles tend to deaden our consciousness and really don't save us much time, when you consider how much time we have to spend earning money to pay for them, the time we spend working on them, the time we spend using them for trips we wouldn't otherwise make if we didn't have them, and the money we spend because they give us access to things we wouldn't otherwise buy.

We don't own a car ourselves, but still we manage to borrow one often enough and I'm not always sure that we come out ahead using it, when I consider all the time and costs (pollution and ennui included).

But I am sure about our mare. Our experience owning, working and living with her has been a good one and it has been an essential step in our search for a clean, agreeable and rewarding way of living and providing for ourselves on the land. In fact I don't see how we could make our life here without her.



THE WATER CYCLE

Rain falls. Water nourishes the soil, unites into oceans, rivers and streams. Even as it falls, some of the rain is vapourised by the heat of the sun and is absorbed by the atmosphere.

Water rises as vapour from the oceans, rivers and streams and from wet ground and forms clouds, condenses and falls again as rain, snow, hail, mist or dew. So the cycle continues.

This endless circulation of water as a liquid, solid (ice) and gas (vapour) is known as the hydrologic cycle.

Water remains constant on our planet. Little has been added or lost from the original supply of water in the hundreds of millions of years since the first clouds formed and the first rains fell.

At any moment, most of the earth's water resources exist as water vapour in the atmosphere.

Some of the water in the soil is taken up by plant roots and most of this is evaporated from the leaves — a process called transpiration.

Excess water sinks into the earth and passes beyond the reach of plant roots, entering the cycle again in the ocean, as a spring or when it is tapped by a well or bore.

waters of life

A river flowed out of Eden to water the garden, and there it divided and became four rivers. The name of the first is Pishon; it is the one which flows around the whole land of Havilah, where there is gold. . . . The name of the second river is Gihon; it is the one which flows around the whole land of Cush. And the name of the third river is Tigris, which flows east of Assyria. And the fourth river is the Euphrates.
GENESIS 2:10-14

Any search for the origin of the Garden of Eden must focus on Mesopotamia (now Iraq), where the twin rivers of the Tigris and the Euphrates provided abundant water for the cities of Ur, Babylon, Mari, Akkad and Nineveh.

Nobody today is sure of the location of the rivers Gihon and Pishon, however, so there is no certainty of the exact site of the legendary garden. The theme of the first man made in the image of God in a garden with the tree of life is a constant element of the creation stories of many lands.

As far back as human thought can reach there was water. The earliest known gardens were in fact water gardens and the Biblical description quoted is often seen as a record of a classical eastern garden plan — a fourfold field plot divided by four streams.

Four of the earth's great civilisations sprang up along the banks of huge rivers — the Nile of Egypt, the Tigris-Euphrates of Mesopotamia, the Hwang-Ho (Yellow River) of China and the Indus of northern India.

In Mesopotamia planned, large-scale irrigation systems of canals, dikes and reservoirs gave rise, by about 3000 BC, to a primitive form of democracy based on the vote of freemen.

Water is the primary element in the Assyro-Babylonian creation story. Apsu, who was thought of as the sweet waters which wandered inside and encircled the earth, merged with Tiamat, who represented salt water, or the sea. From this union came all life and all beings beginning with the gods.

The god Enki, or Ea (literally "house of water") was considered as the fertilising power of water. His duties, described on a Sumerian clay tablet, were:

> **To clear the pure mouths of the Tigris and the Euphrates, to make verdure plentiful,**
> **Make dense the clouds, grant water in abundance to all ploughlands.**
> **To make corn lift its head in furrows and to make pasture abundant in the desert,**
> **To make young saplings in plantations and orchards sprout, where planted like a forest . . .**

Enki's daughter, Nanshe, was the goddess of springs and canals. Her emblem was a vase in which a fish swam. Enki himself later became a more powerful entity as a source of wisdom and knowledge and was represented surrounded by a symbolic stream containing fish.

The tree of life as a stylized palm or fig tree often occurs in Mesopotamian sculptures, inscriptions and seals. A mural showing an Amorite king of Mari proclaims him to be "the gardener in the garden of god" with the duty of watering the plant of life.

A variation of this motif is a statue of King Gudea of Lagash (2275-2260 BC) pouring a never-ending stream of water from a jar, a fertility ritual.

A later Assyrian ruler, Sennacherib, built a 30-mile canal in 700 BC to bring water to his capital Nineveh from distant mountains. More than two million stone blocks were used in the construction of an elaborate aqueduct along the route.

Sennacherib described his feats of water engineering in an inscription on the aqueduct:

> **I had a canal cut to the meadow-lands of Nineveh. I caused a bridge of limestone blocks to span deep-cut wadis, and let those waters pass over upon it. In order to draw water daily, I had ropes, bronze cables and bronze chains made, and I had beams and cross-bars fixed over the wells instead of poles.**

The king's pleasure gardens in Nineveh were planted with fruit trees, vines, herbs and flowers.

"Egypt is a gift of the Nile," wrote the Greek historian Herodotus some 2400 years ago.

In one Egyptian creation myth men emerged from the sun-dried mud of the Nile. The river itself was thought to spring from Nun, the great waters, in which lay the germ of all things.

Egyptians revered the Nile as the god Hapi and as various ram-headed (symbol of fertility) minor deities. Isis, who was born in the Delta swamps, was originally a water divinity.

The Nile, which cut its green, fertile swath through the barren desert, ruled their lives. The Egyptians invented the 365-day calendar in response to the river's annual flooding.

They could explain rainfall in foreign lands only as a gift from the gods for those unfortunates who did not live by its banks. The worshipper told the god Aton:

> **Thou makest that whereon all distant countries live. Thou hast put a Nile in the sky, so that it may come down for them, and may make waves upon the mountains like a sea, in order to moisten their fields . . .**

Little is known of the Indus Valley people who flourished in prehistoric times until about 1500 BC. Excavations are still going on at the cities of Harappa and Mohenjo-Daro (near Karachi), each of which covered a square-mile rectangular area.

King Gudea, dispenser of the never-failing water.

Houses in Mohenjo-Daro often had two storeys, with rooms arranged around a central courtyard which usually contained a bathroom. House drains were connected to covered sewers running along the streets. One public bath covered a large block.

To quote from Dr W. Appleton Aiken in a report to the United States President's Water Policy Commission (1950):

> **There is evidence on all sides of the part played by water in the lives of these earliest inhabitants of India.**
>
> **. . . Indeed, water seems here to shape the life of man on every side. Even his diet of turtles, tortises, shellfish and other fishes, fresh or dried, suggests a closer dependence than elsewhere upon this vital force. But, above all, an emphasis upon personal and public cleanliness among the inhabitants of Mohenjo-Daro stands unique in these ancient times and suggests a ritualistic origin for their superb baths and magnificent drainage system.**

Like the Indus, the Ganges and the Brahmaputra rise in the Himalaya Mountains, but flow eastwards, finally emptying into the muddy delta of the Bay of Bengal. The mighty Ganges, India's sacred river, has its origin in a glacier near Tibet. It bursts into the open, through the wall of an ice cave called in Hindu, Gaumukh — the cow's mouth.

When the Moghul conqueror, the Emperor Babar, laid out a garden at Agra, he chose the ancient plan of a plot divided into four by marble pathways. Down the centre of each walk stone channels carried streams of water for his fruit trees. The garden took 20 years to complete.

Hydraulic engineering probably reached a peak of ingenuity in China, where people began to settle along the Hwang-Ho about 5000 BC.

Nearly all of China's rivers flow from east to west and most have been joined by an intricate pattern of man-made waterways running north-south. Earlier than 2255 BC the Emperor Yao appointed the Great Yu as Superintendent of Works, entrusted with draining flood-waters and canalising rivers.

The Hwang-Ho, often called "China's sorrow" has a history of disastrous changes of course and flooding. In 1877 one million people were drowned when the river burst its banks.

Dr F. H. King, who visited China early this century, noted in his book Farmers of Forty Centuries (reviewed in EG9), that the Hwang Ho normally flowed at the rate of 4000 cubic yards of water per second. This rate tripled in floodtime. He asked:

> **What must be said of the mental status of a people who for forty centuries have measured their strength against such a Titan racing past their homes above the level of their fields, confined only between walls of their own construction?**

Dr King was impressed by China's waterworks and the use the people made of canal mud as a fertiliser, which they applied sometimes at the rate of even 70 tons per acre.

> **It is difficult to convey, by word or map, an adequate conception of the magnitude of the systems of canalisation which contributes**

> **primarily to rice culture. A conservative estimate would place the miles of canals in China at fully 200,000 and there are probably more miles of canal in China, Korea and Japan than there are miles of railroad in the United States.**

In Chinese mythology, which mirrored the royal court and the government administration, rain is produced by Yu-Tzu, the Master of Rain, who sprinkles water from a pot with his sword. Clouds were piled up by Yun-t'ung, the "little boy of the clouds".

The Emperor of China's garden near Pekin contained 200 palaces scattered about an exquisite landscape containing many streams and one lake nearly five miles round. Few people ever saw these vast enclosures as they were forbidden to all except the Emperor and his womenfolk.

However, a French missionary, Father Attiret, who was engaged to paint some apartments in the garden, wrote this description to a friend in 1752:

> **They have raised Hills from 20 to 60 Foot high; which form a great Number of little Valleys between them. The Bottoms of these Valleys are water'd with clear Streams which run on till they join together, and form large Pieces of Water and Lakes.**
>
> **. . . The Sides of the Canals are not faced as they are with us with smooth Stone, and in a strait Line, but look rude and rustic with different Pieces of Rock, some of which jut out and others recede inwards; and are placed with so much Art that you would take it to be the Work of Nature. In some Parts the Water is wide, in others narrow; here it serpentizes and there spreads away as if it was really push'd off by the Hills and Rocks. The Banks are sprinkled with Flowers; which rise up even through the Hollows in the Rock work as if they had been produced there naturally.**

Best of all things is water!
PINDAR, Olympia 1.

The ancient Greeks were well endowed with rivers and springs. There were said to be 3000 rivers, each with a bearded and horned river god. Every stream, brook and pool had its water nymph, spinning or weaving at its side, watching over flowers, fields and flocks.

Many springs and streams were reputed to have the power of bestowing poetic inspiration, forgetfulness or even eternal life on the drinker.

Like the Assyro-Babylonians, the first Aegean peoples imagined an immense body of water which formed a liquid girdle about the universe. This was Oceanus, who gave birth to the seas and to the rivers, springs and wells of the earth.

The Muses were originally water nymphs who lived on a high mountain in Boetia, whose wooded slopes were covered with plants so fragrant that they deprived snakes of their venom. At Mount Parnassus the fountain Castalia was regarded as a mouth of the river Styx, which surrounded the Underworld. Water from the fountain was used in purification rites at Delphi.

Achilles was dipped in the Styx by his mother Thetis, who held his right heel, which became the only part of his body which was not immortal. He was killed at Troy by an arrow shot into his heel by Paris.

The Lethe, another Underworld stream, flowed at the edge of the Elysian Fields. Those who drank of its waters forgot the past. Nearby was the Pool of Memory.

The Danaid women were sentenced by the gods to the endless task of carrying water in jars perforated like sieves.This is seen by Robert Graves in The Greek Myths (Pelican) as a reading of ikons which showed moon goddesses invoking rain by sympathetic magic — sprinkling the earth with water.

The Athenians used a water clock made from a jar with a hole in the bottom into which a measured amount of water was poured. It marked the time allotted to orators. In court hearings the aperture was sometimes blocked during the hearing of serious charges.

The Romans borrowed their mythology from many sources, even installing the gods of conquered races in Rome. Their water-supply works, however, were more original.

Tiberinus, the god of the Tiber, had a cult following in Rome and all stretches of water, springs and rivers were deified. The Tiber was so revered that a project to alter its course was rejected by the Senate in the 1st Century AD.

Three of Rome's original 11 aqueducts are still in use today. Originally they supplied the city with 200 million gallons of water daily which was distributed by a complex system of lead pipes and stone and brick conduits.

The Aqua Appia built by Appius Claudius Crassus about 312 BC was the first of Rome's great web of aqueducts. Built of stone, it was 10 miles long and carried water from the Anio, a tributary of the Tiber.

Public baths, fountains, water gardens and fish ponds were part of the classical Roman way of life.

Contemporary with the Old World civilisations was the settlement of the Peruvian Andes where huge aqueducts and stone canals were built to irrigate immense "staircase" terraces on steep mountain slopes.

Rudimentary agriculture in this area has been dated to about 5000 BC when gourds and squash were grown, while the first traces of cultivated maize, beans and

The Peruvian terraces.

manioc appear about 2800 BC.

The "classical" age in Peru is considered to be much later — during the Mochican period of the 3rd Century BC until about 900 AD — when great expanses of desert were fertilised by a network of canals which brought water from coastal rivers. It is thought that guano from seabirds taken from offshore islands was widely used in these South American gardens.

The Incas inherited and improved these waterways until their defeat and the consequent shattering of their culture by the Spanish in the 16th Century.

Further north, in Mexico, the Aztecs believed that Tlaloc (pulp of the earth) owned four pitchers of water which he used for watering the earth. The waters of the first pitcher were good and helped the growth of maize and fruits. But the water of the second pitcher produced spider-webs and caused blight among cereals. The third turned to frost and the fourth destroyed all fruit.

Tlaloc's sister (or wife) was the goddess of running water.

Tenochtitlan (now Mexico City) was a mountain Venice, filled with pleasure gardens, canals, fountains and shining waterways when the Spanish conquistadors arrived in 1519. Bernal Diaz, chronicler of Cortes' expedition, wrote:

> **We were amazed and said it was like the enchantment they tell of in the legend of Amadis, on account of the great towers and cues and buildings rising from the water, and all built of masonry ... And some of our soldiers asked whether the things that we saw were not a dream . . .**

The Aztecs used canoes to bring produce into the city, to sell water and to remove wastes, which were used for fertiliser.

The Tenochcas, who were forced to live in islands in the lake because of the large population of the Mexico Valley, converted marshland into fields and canals. They first made small artificial islands by scooping up mud and holding it in place by a revetment of reeds and later by trees whose roots bound the earth solidly together.

Also in North America remarkable waterworks were built by the Hohokam Indians from about 600-1400 AD. In The American Oasis, Edward Higbee describes the irrigation canals they used to carry water from the Salt and Gila rivers to their desert valleys.

> **. . . By irrigation they created an American Mesopotamia ... Modern irrigation canals occasionally follow courses identical with those selected by the Indians; with our best surveying instruments we cannot improve them . . . Some of the great ditches were thirty feet wide and ten feet deep.**

Reeds, which grew so lushly in streams and swamps gave early man the material to make baskets, huts, thatched roofs, boats, animal snares and fish traps, beds and the first crude furniture.

A reed stylus was probably used to cut the first wedge-shaped cuneiform characters on tablets of river clay. Papyrus reeds were used in the first paper. So the rivers and the reeds gave us the art of writing.

The gateway to Europe from the east was another river, the Danube. From about 3000 BC traces of the progress of nomadic tribes from the shores of the Black Sea can be followed as they moved north-west, burning off clearings and planting grain, then moving on again.

Folk tales from the Slavs, the ultimate settlers along the Danube, tell of the Vodyanoi (from voda, which means water). These monsters waited to drag unsuspecting humans into lakes, pools, streams and rivers and haunted mill ponds, attempting to destroy water mills so that water might flow freely.

Less malevolent in aspect, if not in nature, were the Rusalki, who were the ghosts of drowned maidens. Among the southern Slavs of the "blue" Danube the Rusalki were bewitching sirens who enchanted humans to their death by drowning.

But in the north they were ugly, dishevelled and naked girls with matted hair, whose eyes shone with an evil green fire, who would seize and drown anyone walking by the water at night.

The Rusalki also gave the millers a bad time, breaking millstones and damaging dikes. They could send storms and torrential rain down on the fields and rip fishermens' nets. The only charm against them was to hold a leaf of the herb absinthe in the hand.

The solitary tree persists through mythology. We see it in the sacred pipal tree of India, Buddha's tree of enlightenment and the Yggdrasil of the Norse. In

Geoffrey Chaucer's Romance of the Rose, written about 1370, it is a pine tree:

> **And so befil, I rested me**
> **Besyde a welle, under a tree,**
> **Which tree in Fraunce men call a pyn.**

The tree was higher than all others in the garden and the well turns out to be the one in which Narcissus first saw his own image and fell in love with it.

Water as ice played its part in the creation stories of Scandanavia and the Teutonic countries. Niflheim, a world of cloud and shadows, contained the fountain Hvergelmir, from which spread the glacial waters of 12 rivers.

To the south, in the land of fire, poured the rivers of bitter poison, which gradually set and became solid. When the ice came into contact with the fire rivers, this first deposit became hoar-frost. But warm air flowing from the south began to melt the ice and a giant was born from the tepid drops. He was Ymir, the first of all living things.

The ice also gave birth to a cow, Audumla, from whose udders flowed four streams of milk.

Water was so scarce for the maurading Mongol hordes that their leader Genghis Khan decreed that they should never wash.

The Gypsies, another nomadic people, have a traditional aversion to washing, though some say they are descendants of the water-loving inhabitants of the Indus Valley. The Gypsies instead "bathed" using the folded leaf of a jujube tree in place of soap.

Animals were watered first, then men drank, then, last of all, water left over was used for cooking. This attitude seems rational considering the scarcity of water in desert places where the Gypsies wandered.

They still prefer natural water sources, however, as attested by Juliette de Bairacli Levy, a great friend of the Gypsies, in her book Nature's Children:

> **The Gypsies place great value on natural springs, and wherever they travel they know every spring in the area. On my own far travels I have so often gone to the Gypsies to learn from them where I could get spring water.**

The Japanese heaven of legend resembles the Japanese countryside and is crossed by the heavenly river, Ama No Gawa, which has a wide bed covered by pebbles.

During the creation of the world two gods, Izanagi and Izanami, stirred up the waters of the sea to create an island. Later they gave birth to all the islands which make up Japan.

Thomas Hyll described in The Gardeners Labyrinth (1577) the use of a "tinne Squirte" and "the maner of watering with a Pumpe in a Tubbe" and also "the common watering pottee ... the Thombe layde on the hole to keepe in the aire".

In an illustration in the same book he showed "the maner of watering with a Pumpe by troughes in a Garden". This time the water runs along channels which divide the garden into four plots on the ancient pattern.

In Medieval, Tudor and Stuart times people took great delight in fountains, which were an important feature of gardens.

Every garden, said John Parkinson in his Herbal (1629), should have:

> **... a fountain in the midst thereof to convey water to every part of the garden either in pipes under the ground, or brought by hand and emptied into large cisterns of great Turkey Jars, placed in convenient places.**

In the 18th Century water carriers added their calls to the street cries of London — "Fresh and fair new river water" — they cried — "None of your pipe sludge". For many years Londoners preferred to pay one penny or twopence a day for a pail of water than the 18 shillings a year for "Company's water" delivered by underground pipe.

This may have been a wise precaution (if the water was fresh) as it was water polluted by sewage which caused the outbreaks of cholera which swept London in 1849 and 1853. This was a smaller echo of the Black Death of the mid-14th Century, which killed one-third of the entire population of Europe.

The industrial revolution brought an upsurge in canal building in Britain for cheap transportation between 1790 and 1830. Some of the 3000 miles of waterways built then are currently being revived.

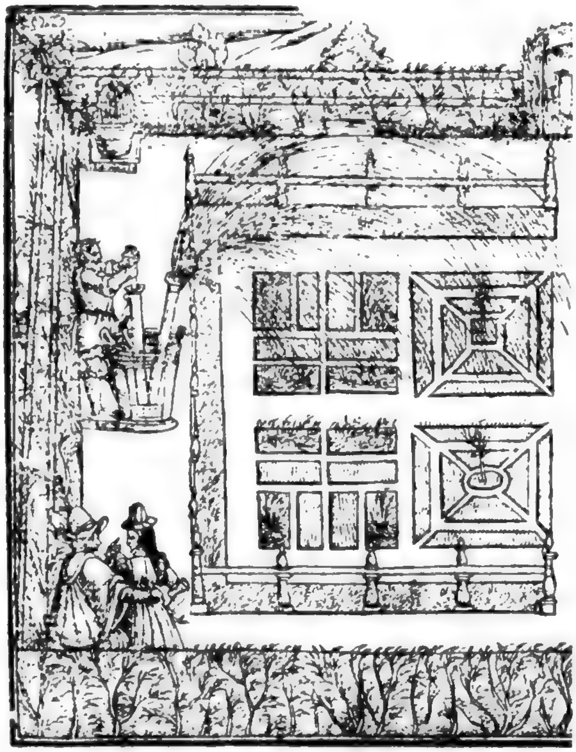
Water has always dictated the location of man's homes, and cities and towns are almost always built on rivers, or where a reliable source of water occurs.

Magic and superstition still surrounds springs, rivers and dark waters. In Britain girls on a summer's night drop their hairpins into streams once thought to be holy.

As water mills became familiar throughout Britain, proverbs evolved about the miller, always a well-known identity in the town or village. The saying "Every honest miller has a golden thumb", quoted by Chaucer, inferred that the miller was less than honest — placing his thumb on the scales when weighing out flour.

An answer supporting the miller evolved in the

The maner of watering with a Pumpe in a Tubbe.



following centuries which ran: "True, but it takes a thief (or a cuckold) to see it". To "drown the miller" meant to put too much water in the toddy (whisky with hot water and sugar).

More water glideth by the mill,
Than wots the miller of.

Wrote — William Shakespeare: in Titus Andronicus.

It was also said that the same water that runs the mill decays it. An unwelcome event was classed: "As welcome as water in my shoes" or as "water in a leaking ship", the equivalent of the modern day "hole in the head".

The etymology of water is derived from Old English **waeter,** akin to Old Norse **vatn** and Goth **wato.**

The rhyming of "water" with "after" in "Jack and Jill" proves the verse to be 300-years-old, even though it first appeared in print in 1765:

Jack and Jill went up the hill
To fetch a pail of water;
Jack fell down and broke his crown,
And Jill came tumbling after.

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The Incas, Alfred Metraux, Studio Vista, London, 1965, 192 pp.

The Story of the Garden, Eleanour Sinclair Rohde, The Medici Society, London, 1932, 326 pp.

Rivers and Men, Robert Brittain, Longmans, Green and Co, London, 1959, 288pp.

The Ancient Engineers, L. Sprague de Camp, Souvenir Press, London, 1963, 408pp.

A triple shaduf.

Dip-lift-pour: This is the age-old rhythm which man followed to collect water, first from rivers and lakes and later from wells. The first water lifting device was probably a jar on the end of a reed rope. Later the jar was swung between two men, a rapid method of irrigation still used until recently in China.

The shaduf, which originated in Mesopotamia, became the traditional method of collecting water along the Nile. The jar dangled from a rope at one end of a pole. A weight at the other end of the pole took much of the work from the labourer.

The Archimedian screw, said to be invented by Archimedes of Syracuse, was a cylinder with a screw-shaped partition inside mounted at a slant with the lower end in water. The cylinder trapped water at each turn of the screw and the water rose to its upper end.

good old h_2o!

All is born of water,
All is sustained by water.
WOLFGANG VON GOETHE

The story of water is the story of man. It is life and death — as essential as air — to us and to the plants and animals on which we depend. It is the fountain of life on this planet.

Nearly three-quarters of the earth's surface is covered with water. It is everywhere — a web of water, above and under the ground, encircles the earth. It is in oceans, seas, lakes, rivers, fields and glistening on rooftops after rain. It is rain, hail, ice, snow, sleet, dew, vapour, humidity, steam.

Water has carved out valleys and shaped and chiselled the face of the earth.

We drink water, we wash with water, we hose the plants, we flush the toilet and we take water for granted. The old saying is true: You never miss the water till the well runs dry.

We spend the first nine months of our lives floating in three quarts of blood plasma. This is a saline liquid, like our blood, sweat and tears — a memory of our watery origins so long ago.

Take a look at yourself: your body is a sac of 65 per cent water. Water makes up 75 per cent of your brain and 22 per cent of your bones.

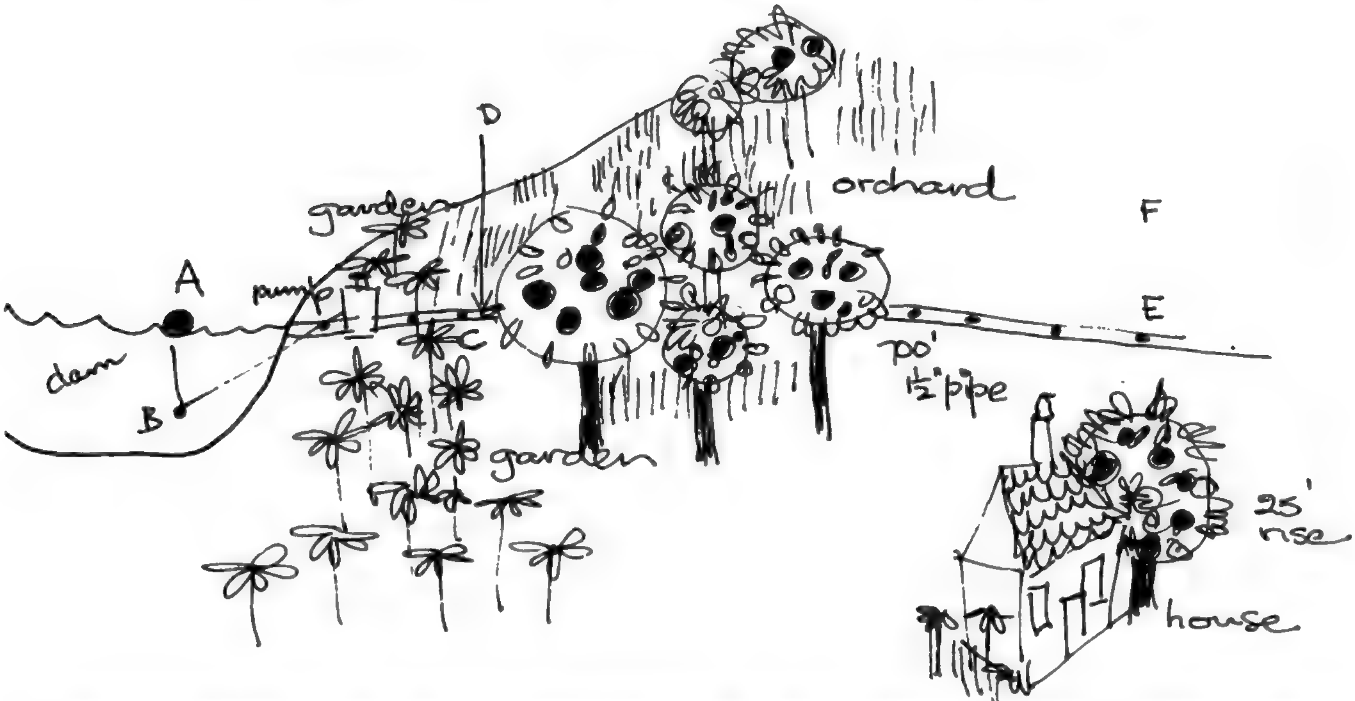
The blood which flows through 60,000 miles of your arteries and veins is 82 per cent water.

In its pure form, water is a liquid without colour, taste or smell. It is a compound of two atoms of hydrogen joined to one atom of oxygen. Water is 810 times denser than air.

Good old H_2O! Water is the source of your existence as a self-sufficient farmer, as a country dweller or as an inmate of a high-rise apartment. Guard it well.

In this issue we cover some aspects of water — various methods of water supply, water power, water history and mythology. We will continue in EARTH GARDEN 12 with further articles on this all important and diverse topic.

Our farm dam



A. Float. B. Foot valve. C. Riser outlet. D. Main pipeline. E. Extra taps for moveable sprinklers. F. Orchard (approx one acre). G. Garden (approx two acres).

BY CHRIS LIST

As we receive about 95 per cent of our annual rainfall during the winter, it is essential to store water and then irrigate during the dry.

Although we have only 30 acres we believe we can make a good self-sufficient living here. We are raising vegetables (about three acres organic, poison-free) and concentrating on carrots, pumpkins, cauliflowers and broccoli for sale and many other vegetables for our own use.

Also we are buying some week-old heifer calves to raise and sell when mature as dairy heifers or house cows. We should have some ready next year.

These provide manure and compost as they are shedded at night on a deep litter of sawdust and straw. The poultry do a good job turning this and, providing there is sufficient moisture, after four to five weeks a highly-concentrated compost is ready for the garden, either dug in or just left on top of the ground.

We would like to hear from Earth Garden readers and self-sufficient farmers and welcome those with mutual interest who may happen to be tripping around.

Chris and Gail List, "Dungowan", Mt Pleasant, South Australia, 5325.

When we bought our land the first consideration of being able to live there was to have a good supply of water.

As the water from the town came only along the main road we decided to have a dam built. Anyway, in the interests of being self-sufficient, water rates and excess charges wouldn't help at all.

The dam site, though not on a creek, was to be in a seasonal drainage gully and would therefore have a good water catchment area (about 20 acres).

We inspected the site and, using a three-inch soil auger, took samples of soil to a depth of three feet. This was to make sure we had a suitable dam building clay. Fortunately the clay was there, just below the subsoil and of a good depth.

The next step was to engage an experienced contractor, whom we located after only one false start and who was, of course, local. This is important as machinery transportation can affect the overall cost considerably.

The contractor decided that the site was suitable and asked us what we wanted to spend. We had already discussed an amount between ourselves and the contractor was happy that he could build a good size dam for that price.

Another thing we asked was that the topsoil should be placed on the dam wall bank to cover clay, to enable grasses to re-establish.

After only four days work we had our dam. My what a size! We were told it would hold about three million gallons with the deepest part about 12 feet. Then we had to await the winter rains for a fill up.

The best dams are built while there is still moisture in the earth — this aids compaction.

Once the dam had filled without any trouble from leaks and so on we set about obtaining equipment to utilize our water.

Water is a difficult commodity to

move, and especially in sufficient quantity. In the cities and suburbs you turn on a tap with (usually) good pressure and without any further thought as to how that water got there.

Our first requirement was a pump — engine driven, as no electricity was available. At first we enquired into having an old four cycle, one cylinder engine overhauled and coupled with an old one-inch centrifugal pump, but as it turned out this was far from suitable.

Luckily the people I went to see did not lead me up the garden path and quietly sat down to question me about what I wanted to do.

After that interview I was a completely different person! Water IS difficult to move. Also after a time I became quite knowledgeable on things like feet per head, high pressure pumps, pounds per square inch, gallons per minute and such.

So we discovered that a suitable unit for irrigating a couple of acres of vegetables (organic of course) would be a high-pressure fire fighting outfit, that is a 1½-inch self-priming centrifugal high pressure pump close-coupled to a 4hp petrol engine. Maximum output was over 5000 gallons per hour with head of 185 feet. Close-coupled is the term used when the pump casing is bolted to the engine and the pump guts are built onto the engine crankshaft.

From the pump came the piping main from which sprinklers could be operated. The minimum recommended piping is 1½ inch poly (two inches is much better if you can afford it) as anything smaller soaks up too much pressure. This chart has some examples:

PRESSURE LOSS FOR 500 FT PIPE FEET/HEAD AT 40 GAL/MIN

Pipe dia	Poly & PVC	Gal Iron approx
1 in	120	150
1¼ in	42	50
1½ in	18	24
2 in	5	7

This type of pumping unit does not supply very high water pressure. If your dam is above your garden then you are at an advantage. But if you are using ground along the main pipe up about 25 feet to an area of higher ground near the homestead — as we are — this takes up a lot of pressure.

To operate 12 butterfly sprinklers requirements are:

Each sprinkler needs three feet head and three gal/min.

Twelve sprinklers require 36 feet head and use 36 gal/min. This is about 2200 gals/hour, which is well within the working range of the pump.

Using 500 feet of 1½-inch piping, 18 feet head is used up. Allow extra if individual hoses are used. Also allow for the extra height water has to be pumped — in our case about 25 feet, so total head required is 80 feet.

Sprinklers:

There are many types of sprinklers available. I prefer the butterfly, rotating frame type as they are less expensive, and have a lower pressure requirement (8psi) and put out a good quantity of water over a given area.

The knocker type sprinklers have a high-pressure requirement starting from 30psi up to 70 plus psi.

When using a petrol engine driven pump it is necessary to get the maximum area watered in a given time.

Irrigating using butterfly type sprinklers one hour on section A is sufficient, then move to B for one hour and so on to C and D . . . four hours pumping time.

Using knocker type sprinklers at least three hours on A-B is required before you are able to move to the C-D section. This involves six hours of pumping time.

Pressure:

Six sprinklers — butterfly type — require 8psi at 1000 gals/hour to cover an area of 30-40 feet in diameter.

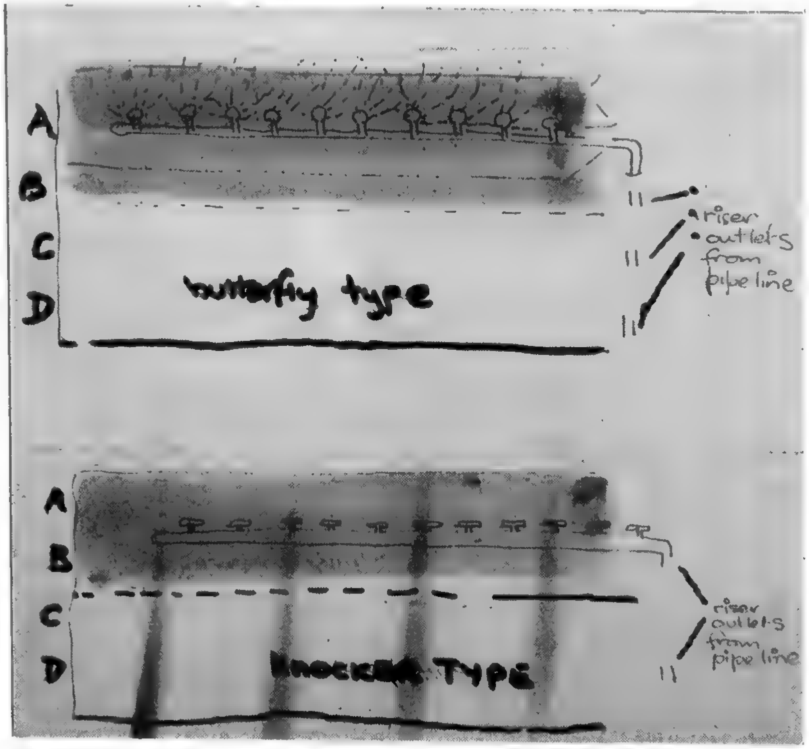
Four sprinklers — knocker type — require 45-60psi at 1000 gals/hour to cover an area 75-90 feet in diameter.

Farming Hints:

1. A fine line around the moon indicates rain within the next 24 hours.

2. For acid soil the addition of ground limestone at the rate of 1 tonne (12 bags) to the acre raises the PH 1 point. ie If acidity is 4.8 PH for legumes etc PH of 6.8 required, therefore apply 1½ to 2 tonnes per acre.

sprinklers



BY DI MERCER

The man who introduced me to a hydraulic ram said it was as near as you could get to perpetual motion.

I thought he was pulling my leg, but after having used one for two years, I admit he was right. Compared with the hand-operated pump I used as a teenager and various motor-driven devices I've battled with since, a hydraulic ram is as trouble free as you can get.

All it requires is a "fall" of 3 feet (either a direct drop or a gradual fall) and it will pump away happily , 24 hours a day, delivering about two gallons per minute, which, after the full 24 hours, amounts to a very useful body of water.

With 1000 feet of plastic piping, some iron piping and installation, the cost was nearly $300. That was nearly three years ago, so prices have doubtless changed since then.

I have put in three holding ponds at various points in my steep, terraced garden, and hand water from these.

Acting on what I thought was expert advice I used a Soakit hose with the ram. The poor thing battled away uncomplainingly for several months but finally blew a gasket and the resulting repairs were somewhat costly.

The hydraulic ram is apparently very finely balanced in its operation and did not tolerate the build-up of pressure.

The ponds also give homes to goldfish (to eat the mossie wrigglers), hosts of frogs and water lilies. A tiny green tree frog lurks in the centres of the water lily flowers and eats the beetles which otherwise reduce the flowers to pulp.

I particularly relish the ease and generosity of the hydraulic ram because I spent my early adulthood on a farm during a drought. Water was a precious commodity — we used each drop four times over.

First it had to be hand-pumped from a 20 foot deep well. Twice a week we had a plunge bath (tremendous luxury). The water for this major event was heated in a copper.

You washed the dirt off yourself in a small basin of water on the bathroom floor, using a minimum of soap. Then, bliss, you lay full stretch in the four feet of water in the bath tub and rinsed.

All four members of the family used the same water. Next morning the bath water was used to rinse the family wash. After that it was used sparingly for washing floors, and finally poured lovingly round such plants as deserved the honour of watering.

Is it any wonder I venerate the hydraulic ram?

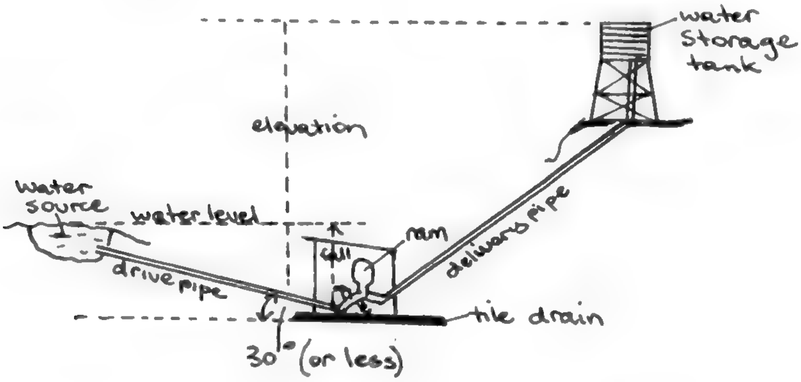
THE NEAREST THING TO PERPETUAL MOTION

The hydraulic ram uses power from falling water to ram or push water to a point higher than its source.

This simple device has only two moving parts. Once in place, it will pump away, 24 hours a day, for up to 30 years with little attention. There is no cheaper mechanical method of lifting water.

Hydraulic rams have been in use for about 170 years. Their invention is often attributed to British hydrologist John Smeaton, who died in 1792.

The source of water may be a spring, river or creek with a flow of at least three gallons of water a minute and a three foot fall in height. The ram will lift water 25 feet for each one-foot fall, so a fall of three feet will pump a good volume of water 75 feet high. It is capable of lifting water 500 feet.

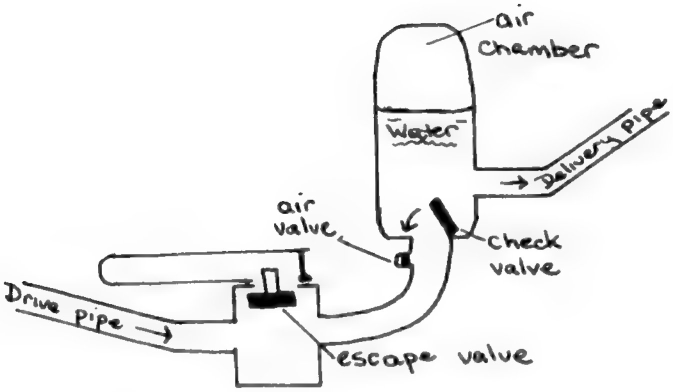


Water is led into a small dam, concrete cistern, channel or ditch from which it can pass through a metal drive pipe with a sharp fall to the ram.

The drive pipe should be as straight as possible, with a length of between five and ten times the fall. It should not slope more than 30 degrees.

The delivery pipe should not have any sharp angles. Its length must be less than 20 times the lift. Bends cause friction in the pipe, slowing down the passage of water and lessening the amount delivered.

Usually the ram delivers water to an elevated storage tank. Water not used at the house can be piped for animal watering, fishpond, swimming hole or irrigation.



HYDRAULIC RAM

HOW IT WORKS

Water rushes down through the drive pipe until it forces the clack or escape valve to shut. This abruptly halts the moving water, creating high pressure which forces some of the water past the check or delivery valve, into the air chamber and the delivery pipe.

Acting like a piston, the water compresses the trapped air in the chamber until the energy of the surging water is spent. Then the compressed air kicks the water back, closing the check valve and giving the water another ram up the delivery pipe.

The vacuum draws a small amount of air into the ram at the same time through the air valve or "snifter", necessary because some of the air has been mixed with water during each cycle. It prevents the air chamber from filling up with water.

Usually the cycle is repeated from 25 to 100 times a minute, but the slower the strokes per minute of the check valve, the more water the ram uses and the more water it pumps.

A wire strainer on the drive pipe keeps out rubbish which may otherwise clog up the ram.

If you have access to a metal lathe and you can weld, you can build your own hydraulic ram from simple plumbing parts for about one tenth the cost of a commercial hydraulic ram. For this you'll need the Popular Science or VITA information listed in the sources.

The parts needed are tees, couplings, bushings, washers, nipples and unions and the air chamber is a two-foot length of three-inch pipe with a welded cap.

The hydraulic ram uses a lot of water to pump a little with each cycle, but the amount delivered quickly adds up. The waste water from the ram is usually carried off by a drain tile back to the creek or stream. A six-inch pipe (at least) is needed to prevent air being pulled back into the ram.

Good luck and good pumping, whichever kind of hydraulic ram you use. As Ken Kern says in The Owner-Built Homestead: "The hydraulic ram is about the most perfect pumping machine invented".

SOURCES

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Manual of Information: Rife Hydraulic Water Rams, Rife Hydraulic Engine Manufacturing Co, Box 367, Millburn, New Jersey 07041, USA 1971, 16 pp (send international reply coupon).

Building a Hydraulic Ram, Don Marier, ASE Book One, 1974, pp 88-89 (also TMEN Handbook of Homemade Power).

Buoyancy Pumps, Water Supply for Rural Areas and Small Communities, E. G. Wagner & J. N. Lanoix, World Health Organization, Geneva, 1959, pp 149-151. (The 337 pp book is very good on dams, wells, pumps etc.)

SUPPLIES

Rife Hydraulic Engine Manufacturing Co is considering reopening agencies in Australia to market its Universal and cheaper Davey hydraulic rams, probably in aluminium versions. Write to the company if you are interested.

Ce Co Co, PO Box 8, Ibaraki City, Osaka, Japan. Several types.

John Danks & Son Pty Ltd, Doody Street, Alexandria, Sydney, NSW, 2015, make "Billabong" Hydraulic rams.

BY PETER STURESTEPS

Equipment: 12-14 beer bottles (cleaned and sterilized); 6-8oz ground ginger (obtainable from health food stores); 1lb sugar (this will give you a number of brews); sultanas; 5 lemons; beer bottle caps and bottle capper (buy where beer kits are sold).

To make plant: In a screw-top jar place 2 cups of water, 8 sultanas, 4 teaspoons of sugar, 3½ teaspoons of ground ginger, juice of one lemon and one teaspoon of lemon pulp. Screw on lid and leave for three-to-four days.

Feeding the plant: Unscrew the lid — you don't need it anymore. Put in 3 teaspoons of sugar, 2½ teaspoons of ground ginger. Do this once a day for one week, then —

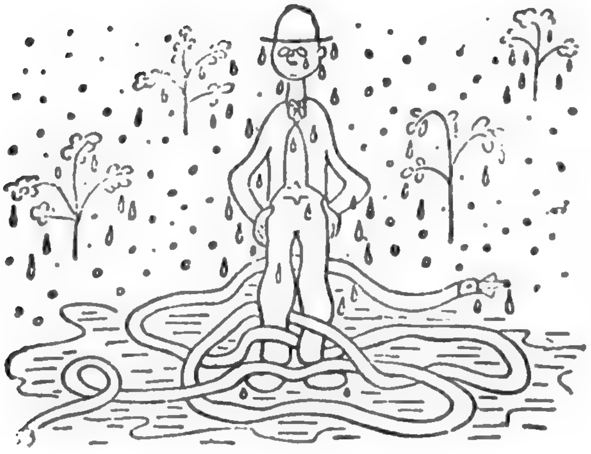
Make the beer: In a bucket holding two gallons of water put 4 cups of sugar and 4 cups of boiling water. Then stir to dissolve sugar. Add juice of 4 lemons.

Then strain plant by placing 4 layers of tea-towel in a sieve. Put the sieve into a bowl and pour the plant in to strain. Be careful not to get any plant into the beer, as it is a strong laxative. Place juice from plant into bucket. Then add 10 pints of cold water and pour into bottles. Add 2 sultanas to each bottle, then seal.

Keep under the house for three-to-four weeks. Halve the plant, putting each half into a separate jar with 2 cups of water. Feed for one week, then make beer again, and so on.

If, after a month or so, you are awakened by loud bangs, don't worry, it's only your bottles of ginger beer popping.

Water in the garden



One would think that watering a little garden is quite a simple thing, especially if one has a hose. It will soon be clear that until it has been tamed a hose is an extraordinarily evasive and dangerous beast, for it contorts itself, it jumps, it wriggles, it makes puddles of water, and dives with delight into the mess it has made; then it goes for the man who is going to use it and coils itself round his legs; you must hold it down with your foot, and then it rears and twists round your waist and neck, and while you are fighting with it as with a cobra, the monster turns up its brass mouth and projects a mighty stream of water through the windows on to the curtains which have recently been hung.

It refreshes you enormously if you squirt with the nozzle against the wind; it is almost a water cure when it drenches you right through. A hose has also a special predilection for developing a hole somewhere in the middle, where you expect it least; and then you are standing like a god of water in the midst of sparkling jets with a long snake coiled at your feet; it is an overwhelming sight. When you are wet to the skin you contentedly declare that the garden has had enough, and you go to get dry. In the meantime the garden said "Ouf", lapped up your water without a wink, and is as dry and thirsty as it was before.

KAREL CAPEK, The Gardener's Year, first published in Prague, 1929. Our edition, George Allen & Unwin Ltd, London, 1936, 160pp. Illustration: Josef Capek.

Plants draw their life from water. They make their food from water and air.

From the time a seed is planted, the nourishment each plant takes in through its roots is carried by water from the surrounding soil and is dissolved in water.

The plant body maintains its proper temperature and rate of growth by transpiration of water through the leaves. It takes up water through fine root hairs which deliver it to the plant's cells.

When water reaches a plant's leaves, the chlorphyll in the cells causes the water to react with carbon dioxide to produce glucose, the plant's food.

Roots reach downward and outward to find water and the soluble plant foods it contains.

Regular and thorough watering gives plants the food they need. A good soaking of the vegetable garden once a week is better than a daily sprinkling with a hose, which rarely wets below the surface of the soil and encourages shallow rooting.

Irregular water supply causes growth cracks in root crops, second root growth in potatoes and blossom-end rot in tomatoes.

Water more frequently in summer and on sandy soils. Early morning or late afternoon is the best time for watering.

Organic matter and a good soil "tilth" will benefit plants by improving the water-holding capacity of the soil.

A mulch covering of about two inches of grass clippings, leaf mould, straw or compost will increase the absorption of water and control weed growth. This conserves water. Mulching also prevents evaporation from the surface layers of soil.

Hoeing and lossening the soil around plants makes a kind of "earth" mulch, but is less satisfactory.

Where water is scarce, clay flowerpots sunk in the ground beside plants and regularly filled will keep the subsoil moist. This encourages plants to root deeply and also cuts down water loss by evaporation. You may also water along trenches beside the plant. Water from a bottle placed in the soil beside plants will gradually sink into the subsoil over a week or so.

In larger gardens, water may be run into shallow trenches running beside the beds, letting water soak in gradually. A canvas or plastic soak-hose is also good for getting water to plant roots.

Shallow-rooted plants need more water than those with deep roots. Thirsty plants include lettuce, beans, silver beet, cucumber, and sweet corn. Tomatoes need water most while fruiting and potatoes while flowering.

As sprinkling often causes a crust on the topsoil because the droplets compact it, you may break the force of the water by tying a bag around the end of the hose or placing the hose in a tin. This stops soil erosion and allows an even distribution of water among the plants.

This way you won't get all wet like Karel Capek.

Final note: It's best to stay out of the garden when plants are wet after heavy rain. Bacteria or fungus spores may be present in the moisture on plant leaves and are easily spread by someone touching the plants. This applies especially to beans.

Turn again, Alston

BY KEN & MARGARET HANSON

Most things worth doing take a lot of work, such as using mudbricks, making stone houses and gardening and farming by natural means. Restoring a windmill is no exception.

Our 1927 Alston was located at the other end of town, but is now working on our property.

Through neglect of occasional maintenance the mill took a great battering in a severe storm by not turning itself off and virtually exploded. It appears that the vane broke loose and swung down and under the wind wheel, which kept spinning, chewing through the vane, slowly but surely folding the brakes into almost unrepairable shapes.

Then the wheel's main frame flew apart and jammed, ending up in an odd question-mark shape. The sudden stop smashed an internal gear and severely cracked the cast-iron head.

Our first job was to dismantle the head, wheel and vane. To get the tower down we had to wreck two 600 gallon concrete-covered galvanised tanks to enable us to lower the tower, which is 24 feet to the cap. This, when down, was dismantled at a join eight feet from the bottom.

The 16 foot top was rolled into a 12 foot trailer and taken home, then the eight foot section was placed in our front garden to be straightened and painted. All the other bits were spread over the backyard and at our welding workshop, where Ken could work on them whenever he had a spare moment.

On close inspection we decided to buy four new gears, cut to suit each other, a buffer spring, 12 new wheel blades, differential head (the pump that pushes the water over the height of the mill) and a few odd washers to a cost of $150. Add to this 300 metres of 1¼-inch poly pipe, four lengths of 1¼-inch galvanised pipe and various fittings and valves which would have to exceed $200. We still have to buy the poly pipe to prevent damage by stock and vehicles.

Over a period of about three months the mill was restored. Alston Windmills, at Gisborne, Victoria, have a catalogue which was very helpful. Parts, by the way, are still available, even back to our new project — a 1921 Alston.

We varied the normal foundation in that we concreted four anchor plates in the ground. With the tower on its side bolted to two of these, we stood it up, using our car and a few pairs of hands and then bolted it to the other two anchor plates.

To get the head up to the top was no easy task, as it weighs about 200lb. With a boom over the tower and a two-to-one pulley system, Ken pulled it up. On the platform, Margaret waited until it was high enough, then guided it to its resting place.

It doesn't sound very hard, but get up there with 20 feet to the ground, 200lb swinging over your head and a stiff breeze that suddenly blew when all was in a state of balance. Sure was a bloody laugh a minute!

When the head was nearly home we discovered a ball-bearing ring had been forgotten, so it had to come up again. When that was done the vane was fitted and, with the help of our very good friend, Peter, we fitted the eight-foot wind wheel. It seemed, when we were about to lift this to the 25-foot level, that even the slightest breeze appeared to be a gale.

When all the pipe work is done, the mill will supply water to our proposed top paddock, our newly-started vegie garden and orchard.

At present we are using a 600-gallon petrol tank that has been dry for more than 10 years as water storage. This will, when money permits, be replaced with a 5000 gallon concrete tank on the hill behind our proposed home site, which will give about a 30-foot head over the garden.

A few words to Bob in EG7 — Alston turns again!

Solarhot water systems, mentioned in EG7 are now at 34 Flinders Road, Earlwood, NSW, 2206. Solar Absorbers and storage tanks.

taking tea

Water is the basis of every kind of drink. Solid foods contain more water than any other ingredient — tomatoes are 95 per cent water!

Making and drinking tea or other infusions of leaves, roots, bark or flowers may be a means of purifying water or simply quenching your thirst, but it is a long-established social custom.

The familiar tea we know is made from the Thea Sinensis bush, a relative of the camellia and a native of China. The Chinese first used its leaves as a poultice, then as a medicine, but soon adopted it as an enjoyable pastime.

As early as 3000 BC tea was praised for its "fragrance, flavour and stimulating qualities". Buddhist priests took it to Japan in the 9th Century, where a highly-stylized ceremony developed around taking tea.

About the same time the North America Indians were searching the forests for special types of holly from which they brewed a potent tea, containing tannin and caffeine. The South American Indians drank maté.

Herb infusions may be made from many different plants and rarely contain caffeine or tannin. Herbs used may be fresh or dried. Home dried leaves will yield green tea — black teas are fermented or dyed.

Weak brews, particularly of rosehip or chamomile, are refreshing drinks for babies and children, and are a good source of necessary vitamins and minerals.

Pottery or glass teapots — not metal — should be used. Water should be at a "rolling boil", but should not have been boiling for too long. The old rule "one (teaspoonful of tea) for each person and one for the pot" applies to dried leaves. For fresh herbs, two or three teaspoonfuls each should be allowed.

Pour the boiling water on to the leaves and allow to steep for five to 10 minutes. Milk should never really be added to tea. It clouds the liquid and masks the true taste. Lemon, however, brings out the flavour.

You can make mineral-rich teas from any of these either singly or in various combinations:

Dried or fresh leaves of sage, mint, rue, celery, comfrey, rosemary, alfalfa, hyssop, lemon balm, thyme, lemon verbena, raspberry, blackberry or marjoram.

Dried or fresh blossoms of clover, chamomile or lavender.

Dried or fresh rosehips.

Seeds of fenugreek, caraway, fennel, dill, coriander and celery.

Tasty combinations include lavender and rosemary, marjoram and mint and sage and lemon balm. You could start by adding mint or lemon balm to "ordinary" tea.

Some teas are delicious cold, especially rosehip, mint, peppermint, lavender, rosemary and lemon verbena. Make a jug, store in the refrigerator and strain before drinking.

Besides their use in food, medicine and teas, herbs have many other practical uses.

To stimulate the skin and hair, infusions of borage, lavender, eau-de-cologne mint and rosemary may be added to your bath water.

Strong brews of lavender, lily of the valley, sage or burnet are used as a face wash to aid the complexion.

Add a teacupful of rosemary tea to your hair rinse and you can expect to have shiny, fragrant hair. It's also supposed to prevent early baldness. Blondes keep their hair light and bright by using a similar preparation of chamomile.

An infusion of 1½ ozs of dried sage leaves steeped in a pint of boiling water can be used for the external treatment of sores or ulcers, as an astringent, or as an anti-dandruff hair rinse. Half an ounce of borage leaves steeped in a pint of water makes a soothing wash for sore eyes.

— Irene.

water facts

The amount of water needed by homestead animals varies with the kind of food given, the climate and the condition of the livestock. This is a rough guide:

Cow: From six to 20 gallons, according to milk yield and season of year.

Pig: Sows about five gallons of water a day, or more.

Sheep: At grass, little or no water. Those on drier food and ewes in milk need half to one gallon a day.

Horse: On grass, six gallons a day. Working and fed on drier food, eight gallons.

Hen: Roughly a gallon a day for each 20 hens in lay.

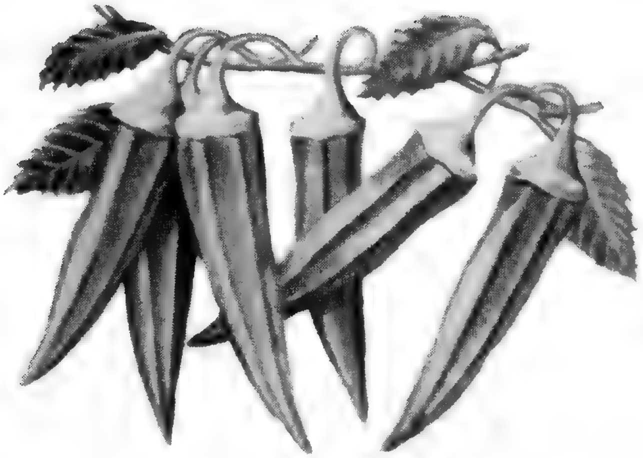
Duck: They should always be liberally supplied with water, day and night, though they puddle as much as they drink when given water in troughs.

In Australia it takes roughly 65,000 gallons of water to make one ton of steel and 56,000 gallons to produce one ton of wool.

This table shows the average water requirements in growing and making some agricultural products.

PRODUCT	**WATER REQUIRED Gallons**
1 loaf bread	560
1 gallon milk	3300
1 egg	220
1 orange	110
1 3lb chicken	3300
1lb meat	11,200
1pt beer	300
1lb butter	2400
1lb rice	350
1lb dried fruit	240
1 man's woollen suit	224,000

Source: Man, the Earth and Tomorrow, D. C. White and C. S. Elliot, Natural Resources Conservation League (Victoria), Cassell, 1969.



OKRA

BY ELISE B. DUNN

Eat hibiscus? Sounds as exotic as lotus eating, doesn't it?

Actually, **Hibiscus Esculentus,** commonly known as **okra** or **gumbo,** is a food extensively eaten in many parts of the world.

Taken to the West Indies in slave ships from the Congo, okra is a highly adaptable annual which will thrive wherever maize or cotton will flourish. It is not a temperamental plant and will grow in a hot, dry climate.

The flower, very similar to the ornamental garden variety of hibiscus, is yellow with a reddish centre. When the blossom has dropped off, the resulting pod, about 3 inches in length, green with ridges and with tasty white seeds, is a delectable vegetable when picked young.

The plants bear fruit over several months — so it is not a case of feast or famine with the dependable okra. In the tropics where green vegetables are not abundant, it is a welcome addition to the diet. On the island of St Croix in the West Indies, it is lovingly referred to as 'Cruzan asparagus'.

In Turkey, in the vicinity of Istanbul, it is grown on a large scale. The dried seeds can be used as a substitute for coffee. In the Middle East, the fruit and leaves have long been used as herbal remedies in poultices to relieve stubborn infected swellings.

In the southern United States it is one of the main ingredients of gumbo, a stew-y concoction made with prawns and crabs which reaches the peak of perfection in the finest restaurants of Old New Orleans.

Did you ever wonder what the words to the song, 'Jambalaya' meant? **'Jambalaya and the coffee's fine and a File Gumbo',** goes this catchy tune. File, a powder made from sassafras, is another ingredient in the gumbo.

The word okra is a corruption of the word **nkruman,** the name for this plant in the chief language of the African Gold Coast. The word gumbo is derived from the African word **ngombo,** which means a soup thickened with the pods of the okra.

To cook the okra (young, tender pods) simply wash, put in the top of a double boiler and steam for 20 or 30 minutes. When tender, serve buttered, with salt and pepper. If boiled in water it will tend to develop a consistency of mucillage which is not pleasant. Or steamed pods marinated in French or Horseradish dressing make a very tasty salad.

Okra is a happy addition to vegetable soups just sliced and added with the vegetables. In this case the mucillage tendency is a boon in thickening the soup. It is a great companion of tomatoes and capsicums.

Fried okra (sliced and dredged in flour, salt and pepper) has a surprising taste similar to fried oysters.

For the calorie-conscious okra is good news — only 28 calories in eight pods, a normal serving.

Come on Australians! Live a little! Start growing — and EATING hibiscus!

Briefly...

BOOKS

The **Whole Earth Epilog** (Penguin) offers the best $4 worth of information on self-sufficiency we know of. It comes as a continuation of the Last Whole Earth and reaffirms its skills and direction. At good bookshops.

Ken Kern's **The Owner-Built Homestead** is a bridge between mere enthusiasm and the reality of "back-to-earth" ideals, offering sound advice for planning and efficiently running your homestead.

In 205 pages it covers water development, soil management, sod and row crops, fish culture, fencing, animals, sanitation (with plans for a compost privy), food preservation, nutrition and a lot more. It's $US5 from Owner-Built Publications, PO Box 550, Oakhurst, California, 93644, USA.

The **Owner-Built Home,** reviewed in EG 9, is now $US7.50 from the same address.

HARDWARE

Warning: **The Cinva Ram** (EG 5) has rocketed in price to $265 and readers have experienced delays of several months in deliveries. This makes "cheap" mudbricks expensive by any standard.

The **Bunyip Slipper Imp,** a successor to the chisel plough, digs by vibration to deeply rip soil. It may be used for scarifying, mulching, furrow grain and row crop work, cultivation, weeding and digging and literally creates topsoil. Write for information to: P A Yeomans Pty Ltd, 100 Denison Street, Hillsdale, NSW, 2036.

The **Little Ark** stone flour handmill has one version adaptable to electric, petrol, treadmill or watermill power. The suppliers, Australian Retsel Distributors, PO Box 712, Dandenong, Victoria, 3175, also stock Corona and Retsel burr mills. Write for a catalogue.

Land Lines

Land lines is a free service for EARTH GARDEN readers. It is intended to help those seeking to buy or sell land or searching for it, and those joining together for group land buying or allied reasons. It is not a lonely hearts column.

Readers must give their full names and addresses as proof of their sincerity. They have the responsibility to thoroughly check all deals.

I have a couple of small acreages on the North Coast — would prefer to sell them to someone who reads EARTH GARDEN.

Sincerely, Brian Halesworth, 23 Lindsay Street, Narrabundah, ACT, 2604.

Eight shareholders wanted (couples) for organic farm to be started in a beautiful fertile valley, consisting of 209 acres plus an option on another 100 acres of Crown land (Tamborine Valley).

This property is about 30 miles west of Hobart, Tasmania. We are looking for people with enthusiasm and ideas regarding building, growing organic crops (for which there is a market in the area), methane, solar heating, livestock, waterwheels — and your own thing.

It's a beautiful environment for children and, with us all working together, we can lead a very full and happy lifestyle. We have no use for dropouts, fanatics or people with religious kicks as this is going to be a constant community concern.

The deposit has been secured, so please contact as soon as possible.

Joe and Sandra Stubbington, 3/55 Carlisle Street, Rose Bay, NSW, 2029. Telephone: 371 5654.

We are one couple looking for the right land, with only $5000 to spend. If there are others in the same situation we would love to hear from you. Being sceptical of large communes, it would suit us to find only one or two other couples or people who are interested in maximum privacy and practical co-operation.

As we are mainly interested in eating fruit and vegies, it would probably be easier if we did not buy with anybody into beef or poultry farming.

Love, Ken and Virginia Leslie, C/- 7 Stradbroke Avenue, Toorak, Victoria, 3142.

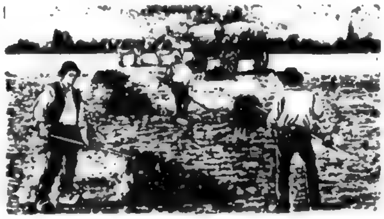
I have a project, now beginning to take shape. The land consists of 160 acres here, divided into about 10 acre shares, held by a company, and leased to each shareholder on a perpetual sole-use basis. We're hoping to evolve as a co-operating community — some people are already here full-time: building — stone, clay and timber are available — and the soil and water situation is good.

Families with primary-school-aged children would fit in well — a school is proposed. There are no building restrictions and many people interested in alternative lifestyles living in the area.

Comment: Latest price on the Cinva Ram (EG5) is $265 and going up.

An agent here did not recommend the Gyro pump (EG8) for regular use. He regarded it as a toy.

Peace and Joy, Patricia Meyer, C/- PO Witchcliffe, WA, 6286.



We have 16 acres of freeholding land, and a lease on a further 3-4 acres. Mostly rugged-type bushland, but with a sizeable area suitable for cultivation. A permanent stream forms one boundary and is a beaut swimming place. Many tropical trees planted — mangoes, paw paws, bananas, large variety of citrus, plus figs, mulberry, guavas and ornamentals.

Four bedroom weatherboard house with electricity — large work shed. All this just two miles from town. Anyone genuinely interested in buying can find us by travelling along Roiko Road, and taking the dirt road to the right opposite the Rifle Range Clubhouse.

Don and Judy Fitzsimon, PO Box 633, Mareeba, Queensland, 4880.

We are a family attempting to purchase 50-150 acres of bushland. Location is no object. However, some form of water supply is essential. Anyone interested in selling land of this type, please reply as soon as possible as we are anxious to establish a subsistence farm.

Janette Fraser, 17 Curtin Crescent, Dandenong, Victoria, 3175.

I, being an old age pensioner and having 19 ½-acre blocks to myself would be willing to help honest Earth People of any age to get started with their own piece of ground where they can build and grow what they like, with very little money.

I own a new Gem (Howard rotary hoe), a new concrete mixer, forms for making concrete and earth blocks which they could borrow and I offer every help concerning building and growing what they need.

My "commune" will start on September 1, 1975, and a number of people are welcome to join me in the effort. One condition — there is no room for tobacco and excess alcohol on my piece of ground and no discrimination against anybody of different convictions or colour of skin.

Yours, F. J. Hupp, C/- PO Lyndhurst, NSW, 2741.

We are a couple in our early thirties with four children (ten years to three years) and wishing to leave the system. Could anyone suggest an alternative, self-sufficiency etc, as a family group within a group!

Please contact Larry Green, C/- Emu Park PO, Queensland, 4703.

Desperate for some land, northern NSW in foothills (1500-1800 feet) in a line north from Gloucester to Tabulum. Have in mind 80-100 acres of heavily-timbered land. Don't mind if it's rocky. Thinking of something a farmer can't use for grazing and would be glad to get rid of. Maximum price $20 per acre.

Kevin and Sybil Free, Emu Creek, Walcha, NSW, 2354.

We are two young couples who have been planning to move to the country for some time. Our intention is to set up a village-like community, where people have individual living and working areas, but also common land.

We intend to aim for self-sufficiency without dominating the environment. Although suburbanites at present, we already produce a lot of our own food.

We have looked at some land (160 acres) that we consider very suitable, but we don't want to proceed any further until we have several other couples who can join in on the "ground floor" and be part of the initial spirit of community that we feel is so important.

So if you have a good heart, a good pair of hands and you are willing to invest some money in such a place, but would like to know more, then we'd love to hear from you.

Wishing you happiness, Colin R. Macpherson, 23 Peate Avenue, Glen Iris, Victoria, 3146.

Hello from Tassie. We are buying a beautiful, fertile valley near Hobart — 209 acres of paddocks, lovely fast-running stream, tall trees, bush and wildlife. We want to turn this into an organic farm, preserving much of the natural surroundings and want to share this with nine other couples, children as well.

People who are interested in living in a small community and helping each other build houses, working together on the farm to be as self-sufficient as possible. We are interested in all crafts, music, carpentry, blacksmithing and, eventually, an outlet in Hobart for our organic produce and what we make.

Shares are $2000 each couple and terms are "Tenants in common", everyone with an equal share and vote. Hoping this may be another link in the chain.

Love and peace, Angie and Paul Beard, 19 Fraser Street, Newtown, Hobart, Tasmania, 7000.

For sale: 230 acres of very secluded virgin land in the Bloomfield area, North Queensland. Pockets of rain forest, but mainly open forest country. Permanent creek, 800ft above sea-level. Right on coast — views for 25 miles from north-east corner over the coast to Rattle Snake Point and beyond. Special lease, 17 years to run. Private sale.

M. Tercier, PO Box 128, Terrey Hills, NSW, 2084.

Sunrise Farm Co-operative is seeking several family units or single persons to live and work on 875 fertile acres. There are five homesites available. You can build your own home, all materials provided.

Goals are self-sufficiency and spiritual advancement. We are vegetarian and organic. Knowledge of the arts of self-sufficiency is useful. For more information, send a stamped, self-addressed envelope and some information about yourselves.

W. Tree, Buchan, Victoria, 3885.

We've been saving for the past five years and now wish to purchase a small acreage for organic gardening and becoming more self-sufficient. We are totally ignorant of soil requirements etc, and would like to meet people in the Perth area who are familiar with the sandy soil and may be prepared to give us some guidance.

Jennifer and Steve Lewis, 82 Milner Street, Balcatta, Western Australia, 6021.

Like-minded persons needed to share 166 acres in beautiful Obi Obi valley, via Mapleton, Queensland.

Further particulars from Elspeth Hagenov, 28 Aspland Street, Nambour, Queensland, 4560.

At present we're slaving here, but our aim is to start our new life in more congenial surroundings, where we can grow food, animals and children. We're thinking of the Mackay district and during our holidays, from April 29, we'll be probing around there.

Is there anyone in that area, already settled or maybe working towards their dream, who'd like to talk to us while we're there? Ideas, business deals, partnerships, idle chatter — any of these will be very welcome. We'll also be going further north, to Cooktown and Chillagoe, so the Mackay limit isn't prohibitive.

Best wishes, Ken, Noreen, Adam and Nina Robertson, 12 Seventh Avenue, Mt Isa, Queensland, 4825.

I am a free-thinking 25-year-old female school teacher, looking for a piece of arable land of about five acres within a 150-mile radius of Melbourne. Maximum price $4000. Terms preferred. If someone already has a suitable set-up I would be interested in partnering them.

However I initially want the land for a country retreat and wouldn't consider living on it permanently for the next few years.

Judy Bayliss, 11B Wynstay Road, Prahran, Victoria, 3181.

We are two young guys with modest capital but fervent hope that we might find some fertile, naturally irrigated land close to either Melbourne, Sydney or Adelaide so we might commute to jobs while setting up. Enough timber to use for dwellings and large enough to provide privacy.

Please write: Bob and Pete, C/- 5 Majella Court, Kew, Victoria, 3101. Hare Om.

I am interested in buying a few acres of land (about five or ten depending on price) in the Kyneton, Malmsbury or Daylesford area, either timbered or cleared. I want to have a go at growing trees native to other States as well as Victoria, preferably just off the main drag somewhere (he's not asking for much, is he?).

Doug Marsden, 59 Surrey Road, South Yarra, Victoria, 3141.

We are a young couple, 29 and 32, interested in buying a farm outside Perth. Our main interests is a quiet, green place with its own water supply so we can have a garden and a few farm animals.

We are nature lovers, interested in organic gardening, and would like to be near like-minded people. Any information would be appreciated.

Maureen Marchant Thompson, 12/16 Adam Street, Burnley, Victoria, 3121.

We are mainly interested in the region between Tully and Cairns in North Queensland and aim to buy as much rainforest as is possible. Neither of us are committed to doctrinaire concepts for ideal lifestyles. We believe each person has to make his or her own decisions. We would be very interested to hear from people who may be interested in joining us.

Love and Peace, Andrew Dunstone and Lyn Morrow, 177 Kennedy Terrace, Paddington, Queensland, 4064.

Our interest has been kindled on the construction of housing with mud bricks, and your article on the CINVA RAM was the culmination of many years of wondering on the best method of making these bricks. We would be most interested if any EG readers have a 'used' Cinva Ram which they would be willing to sell and so help us begin immediate production.

Audrey and Malcolm Grant, 6 Hamilton Street, Gisborne, Victoria, 3437.

Are there any EARTH GARDEN people near the Tweed Heads-Murwillumbah area? We'd like to hear from you and share ideas.

We need practical experience in just about everything — goats, cows, pigs, hens, vegetable growing, fruit growing, beekeeping, pottery, building your own home etc. Can anyone near here help? We're prepared to work to gain knowledge, but weekends only possible.

Also does anyone around here know of a small acreage for sale within 50 miles of Tweed Heads amongst mountains, the more isolated the better, preferably virgin land with creek.

Peace and love, Ted and Lusa Lange, Bilambil, RSM, Tweed Heads, NSW, 2485.

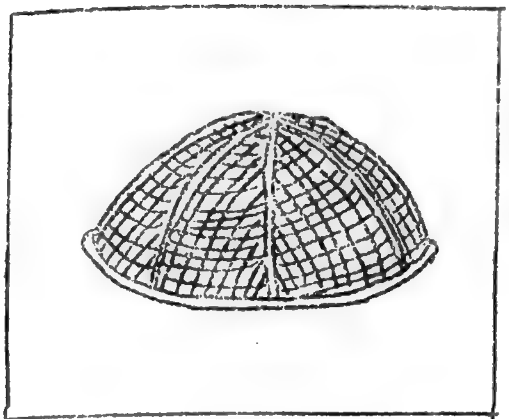
I am 30, with an 18-month-old daughter and feel strongly about the environment she is growing up in. I am independent, capable and not afraid of hard work, interested in art and crafts and have some knowledge of organic gardening and vegetarian cooking.

I wish to shed the phony, materialistic trappings of the environment I have grown up in, and which my daughter has a danger of acquiring.

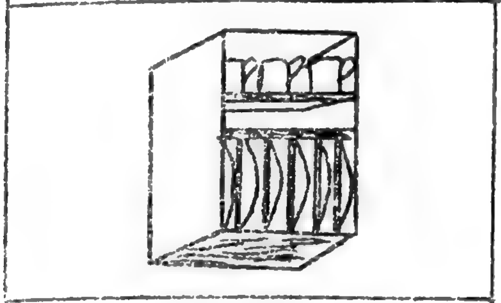
I feel the answer is in a more natural, peaceful community existence, living off the land, where my daughter will be free to grow up without the rules and restrictions of our modern society, and where she can mix with other children whose parents feel as I do.

Am not interested in any communes where there are drugs.

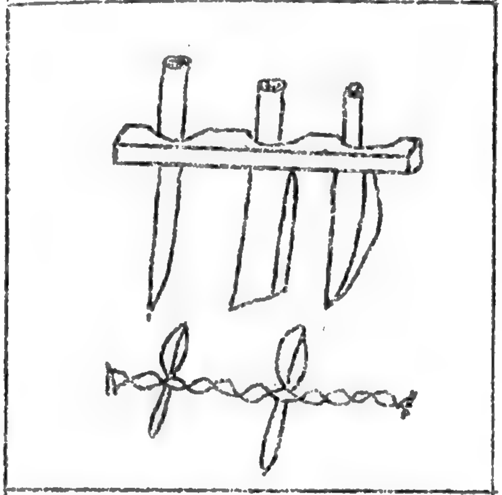
Sonia Ryan, 57 View Street, Wooloowin, Queensland, 4030.



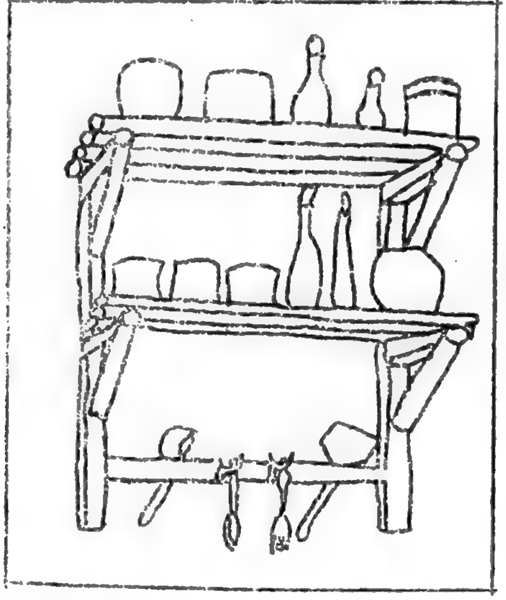
Food cover
Made from mesh wire and bamboo.
If you have no mesh wire you can use mosquito net.
Use it to cover plates of food.



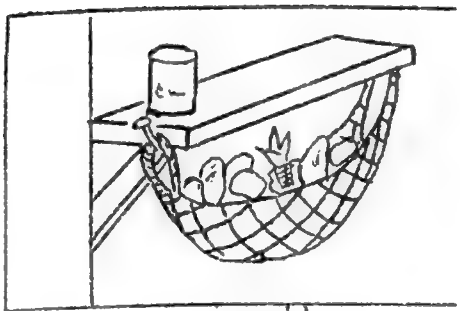
Hanging cupboard
Made from boxes or timber scraps.
Top shelf for cups and glasses.
Middle shelf for cutlery.
Bottom sections for plates.

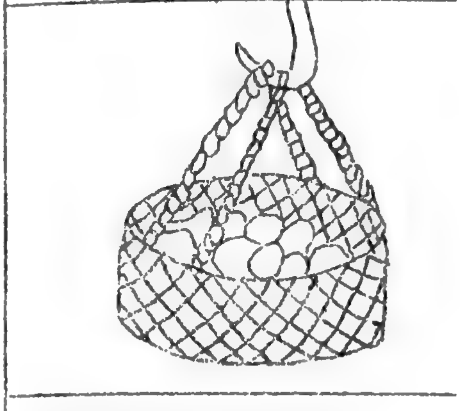


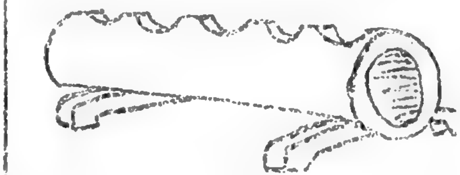
Cutlery holders
Made from wood, bamboo, or twisted rope.
Keeps cutlery together, easy to find, and away from children.

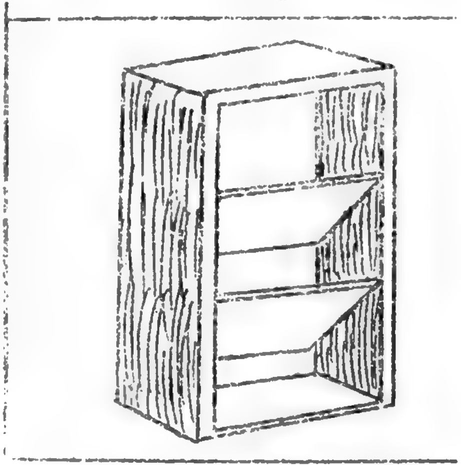


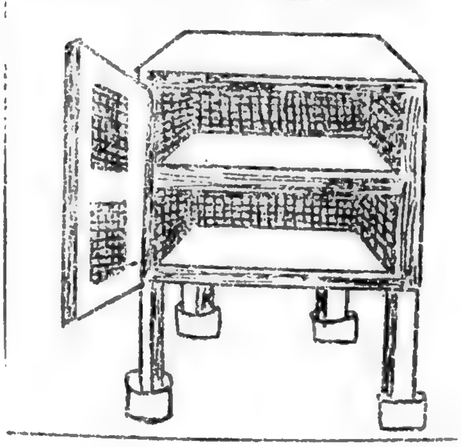
Storage shelves
Made from bush timber or bamboo.
Can be used for storage tins and bottles, and for hanging cutlery.
Make sure to put it into a strong wall.









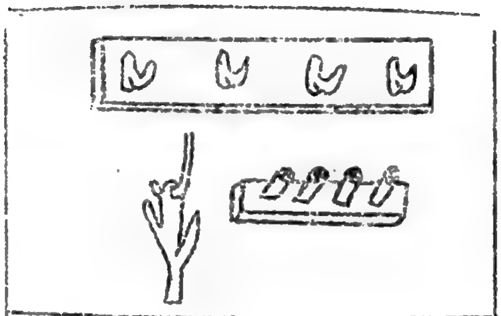


Raised shelf and sling
Can be made out of bush materials, or scrap timber.
Keeps food and other things up away from children, animals etc.

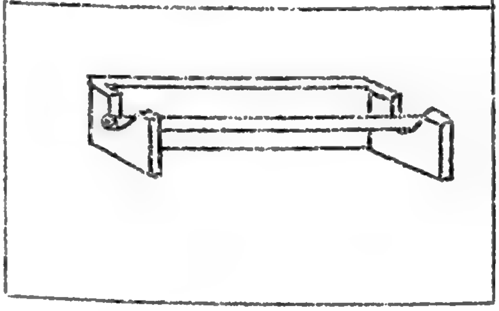
Hanging basket
Hang it from a hook or nail in the roof.
Can be made from string, rope, or coconut leaves.
Keeps food away from pests.

Egg rack
Protects eggs from breakage.
Keeps eggs cool and so they keep for longer. Made from bamboo.

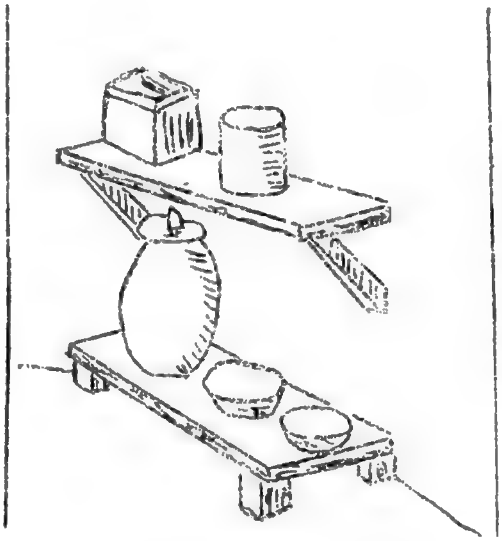
Vegetable storage bin
Made from a wooden box. Use wire netting, arc mesh, or woven leaves for the shelves.



Hanging hooks
Can be made from hooks, nails, wire, or parts of branches.
Very useful for hanging many things such as clothes, towels, tea towels, pot holders, brooms and brushes, etc.



Towel rail
Can be made from timber and bamboo.
Good for hanging towels and tea towels so that they dry quickly.



Shelves and storage tins and bottles
The best tins to use are milk tins and Milo tins, with the press-down lids. Tins last longer and look better if they are painted. **Don't** paint the **inside** of food storage tins. Make sure you screw lids on to bottles properly and tightly.
Make some labels for your tins and bottles and glue them on.

Sangara Skulanka

Food cupboards
Made from boxes or scrap timber.
Use fine wire mesh on the back, sides and door. This lets the air in.
Put the legs in tins of water, but make sure the sides of the legs do not touch the sides of the tins.
Keep flies, cockroaches, etc away from the food. If you cannot get mesh wire, use woven leaves.

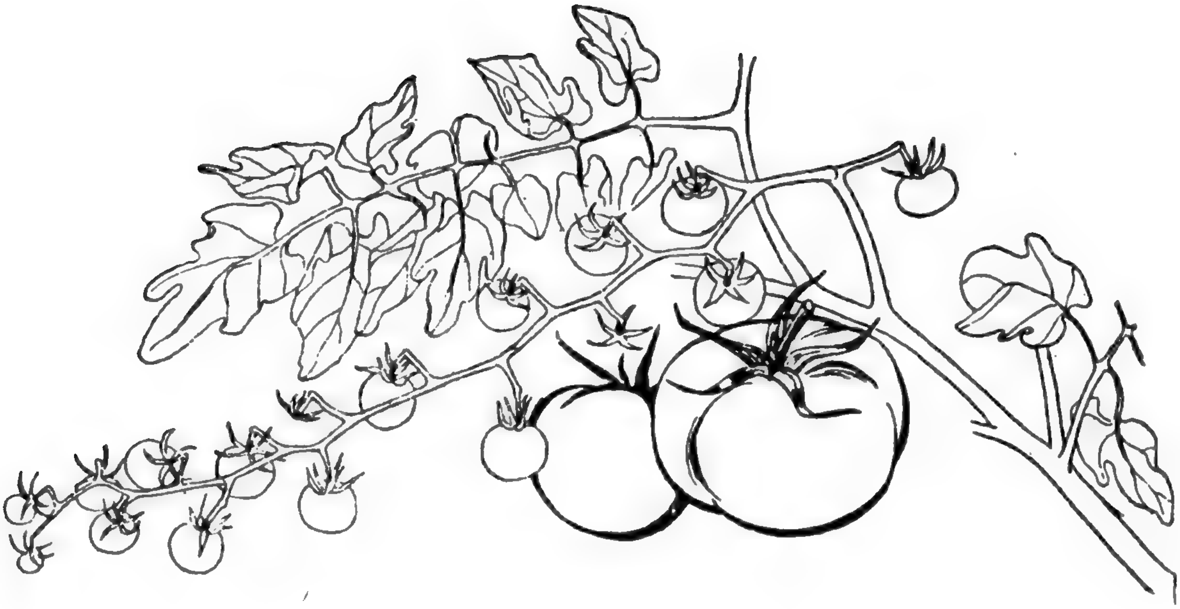
Sangara Skulanka Handbook, M. M. & M. Lean, Education Department of Papua New Guinea, Port Moresby, 1974.

These ideas on kitchen storage in tropical conditions are taken from the Sangara Skulanka Handbook, which was produced by Mike and Marilyn Lean who were members of the foundation staff of the Education Department of PNG.

They gave the book to graduating students in 1974. Copies of the well-produced, roneoed book are not generally available.

Mike and Marilyn, now back in Australia trying their hand at self-sufficiency, would like to see the book published. It contains many useful ideas on tropical living and dozens of recipes.

We hope to use other extracts in the future.



Tomatoes — worth the effort!

BY DAVID ODELL

Good results with tomatoes can usually be obtained by following what might be called the "normal" rules of husbandry advocated by the commercial grower — particularly where the use of artificial fertilizers and chemical sprays is concerned.

But it is possible to cultivate vigorous heavy cropping plants (with fruit of unsurpassed flavour) by following a simple system of preparation and management which even the most inexperienced can handle.

This system relies on organic materials and on water for its excellence. This may not sound very original in itself, but what I have never seen imitated is the method by which these essentials are made available to the plants.

Of course it is too late this season for most of us to experiment, but if you have previously grown tomatoes and intend to do so again perhaps these hints will guide your preparation for next season's planting. The results will speak for themselves.

I find that Grosse Lisse is a consistent variety, especially for the home gardener, and one which has the advantage of good leaf cover as a protection from sun scald. I had better explain that my experience has been limited to the Far South Coast of New South Wales and the ACT. These cool-to-cold areas preclude open-growth tomatoes being ready before Christmas. As it is advisable to avoid the January-February glut I try to have my plants ready for late cropping from March until May, as generally the surplus is readily saleable at this time.

Bearing in mind that these dates can be varied to suit local conditions I find it convenient to sow the seed at the beginning of October, with the plants ready for transplanting in seven-to-eight weeks at the end of November.

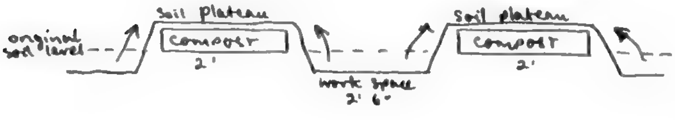
The seedbed should be firm, with seed sown sparingly in rows and lightly covered with a mulch of compost. The firm seedbed prevents seed being "lost", the light covering allows easy germination and because the plants are spaced out they are easier to transplant.

Needless to say it is necessary to keep watering lightly in order to prevent drying off. Open-ground plants should be green, vigorous and sturdy and will compare more than favourably with hot-house specimens which tend to be more spindly unless hardened off before transplanting.

Preparation of the ground is all important to the success of this method — something like preparing the foundations of a house. We'll assume that the area to be planted is only limited by the amount of compost or organic material available. The more compost you have, the better the crop will be.

I stumbled on an easy way to accumulate organic material by getting the local sawmill to dump sawdust in a boggy patch in the cow paddock. Because this area was warm and dry the cows camped there and over a period of time the decomposing sawdust became laden with plant nutrients — in effect an outdoor deep litter — which was "harvested" every year as the basis for the system.

The organic material is spread on the cultivated area in rows two feet wide and at least three to four inches deep, with the rows about 2 feet 6 inches apart. The loose soil between the rows is then hoed or shovelled on top of the organic material to make a double layer of top soil, with a sandwich of compost in between.



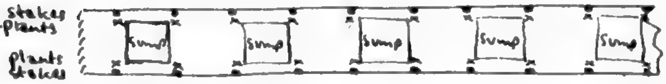
These wide rows are firmed down (by trampling) into "linear plateaux". The advantage of this method is to provide a greater depth of soil for the root area (with the compost ready to act as a spongy reservoir). As the working space in between the rows is down to the subsoil, this soil is not being wasted as it would be otherwise.

Tomato stakes should be six feet long and one inch by one inch thick, sharpened at one end. My method calls for a double row along each mound, with each stake set close to the edge of the "plateau" at about 18 inches apart and directly opposite its neighbour in the parallel row.

Choose a cool evening to transplant the seedlings and give them a good start by disturbing their roots as little as possible (or at least allowing the roots to be arranged in their natural formation) and water in well. The plants are set out on the inside of the double row of stakes as this gives them some early protection.

A "sump" is then hollowed out between groups of four to provide watering points.

A bird's-eye view would look like this:



By this method each plant is adjacent to a watering point which can be "topped up" with more organic material, if available, as the idea is to create a deep, moist area around each plant. Any excess water is readily drained away via the working space between each double row.

I use binder twine to tie the plant to the stake approximately at the points where the weight of fruit will be heaviest, but not too tightly as room must be left for the fruit to develop.

As the loop of twine goes around both stems with the stake in the middle, the whole arrangement tends to be self-supporting.

Watering is carried out regularly by filling up the soakholes. If this is not done when the fruit is setting, the lack of water shows up in the fruit as "blossom-end rot".

Occasionally, when I think the plants feel like a change, I give them a spraying of water. I got this tip from a professional rose grower who never used chemical sprays on his shrubs but relied entirely on water to remove any aphis that might be present (and was disbelieved by many who thought he was keeping professional secrets).

My contention is that sprays are unnecessary on healthy plants and, in growing them correctly, they are self-resistant to disease and insect attacks. Certainly I wouldn't follow the example of a commercial grower who assured me that he didn't have any diseased tomatoes because he treated them with arsenate of lead — he probably didn't have any repeat customers either.

Fruit for home-use can be sun-ripened on the stem — just taste the difference! But if they are to be marketed fruit is picked at the fully-grown green stage when the blossom end is just turning pink. This allows them to travel and be held in store before sale.

As a cash crop or a few for the home kitchen you will find that tomatoes respond to this careful attention because the returns justify the extra effort involved.

Pruning

Pruning, tying and watering of tomatoes are cyclical tasks which should be performed often if the best results are to be obtained. Of these perhaps pruning is the least understood.

An unpruned tomato grows as a bush with a lot of small fruit, but I prefer to shape the plant to two stems as this gives the optimum in large, well-formed fruit. Lateral shoots or side stems emerge between the leaf base and the main stem and these should be gently pinched off when small.

To select the lateral which is to be second stem, choose that one which is immediately below the first spray of flowers as this is much stronger than those below it. If this stem is inadvertantly removed, don't despair as the pattern will be repeated below the next flower cluster as long as the growing point remains undamaged.

If a plant is particularly strong (or if a lateral gets away and is too big to be removed without giving the plant a setback) I have let the plant carry three stems, but two is a good working number with the spacings I have suggested.

After the second stem has been selected all further laterals are rigorously pinched back — but be careful to see that the growing tip remains undamaged until the plant reaches the top of the stake. Then it too can be pinched out as this stops further growth.

Soft Technology

The "new" approach to technology — soft technology, or whatever tag you give it — is in vogue.

When ABC Radio "New Society" programme interviewed British participants in what journalist Robyn Williams called "a more human sort of technology" last August and September they were rushed with requests for repeat broadcasts and scripts.

Since the "energy crisis" of 1973-74 convinced even the most unwilling observers that petrol will probably run out by the end of the century, the average "man-in-the-street" has become interested in what sources of energy will be used to replace it.

Not surprisingly, the answers thrown up by scientists and others were solar, wind, water and methane power, the "old" natural sources of energy which are almost cliches of soft technology.

Soft technology in one sense may be seen as merging together into a practical whole system these non-polluting energy sources after the necessary research, simplification and development.

Our approach to technology is derived primarily from a desire and the search for a self-sufficient life. Soft technology seems to be the answer. A multitude of other viewpoints are valid: soft technology offers hope for the protection of our environment, for the conservation of non-renewable fossil fuels and for the harnessing of natural, renewable sources of power.

It fits well also into other aspects, such as small-scale craft work, community co-operation, doing more with less and many utopian visions (and fantasies).

It is a fact that we rely on machines to perform almost every simple function of our daily lives. We do not understand the way these machines work. This knowledge is confined to the technocrats — an elite group of scientists, engineers and other "experts".

The computer has reduced us to ciphers — 1984 often seems less than nine brief years away. Advanced and high forms of our current technology are to blame for a large part of the earth's pollution and for the huge scale and fast rate of consumption of resources.

Now people are demanding "safe" alternatives to conventional technology. Nuclear power is not the answer — not until safe ways are found to dispose of or re-use radioactive nuclear waste. There is ample coal, but the cost of its extraction from greater depths (and possible conversion to oil) will be highly expensive.

EARTH GARDEN had been working for some time now to de-mystify the jargon used to build a wall around knowledge which everyone should be able to share. No matter how self-sufficient we become, a certain amount of simple technology will be necessary in our lives. Thus this article and the water power section of this issue.

Probably the most readable, non-technical introduction to the subject is David Dickson's **Alternative Technology** (Fontana). It has a bias, readily seen in the sub-title: "and the Politics of Technical Change".

It is thorough, taking the reader through the ills of contemporary technology, tracing back through the industrial revolution and the late 19th Century (mainly Marxist) idealisation of industry, the politics of technical change, premises of Utopian Technology, Intermediate (Third World) technology, and a summary. There is throughout a constant coverage of the major soft technology projects of the present. This isn't a "how-to" book, but will certainly provoke a lot of interest.

The voices of soft technology are two magazines, **Undercurrents** from Britain and **Alternative Sources of Energy** from the United States.

Magazines like **Architectural Design, New Scientist** and **The Ecologist,** all British, often give a coverage, but Undercurrents and ASE are the working tools and information exchanges of the idealists, tinkerers, escaped physicists and journalists who inhabit the soft technology world.

They are filled with articles on making windmills, watersheds, solar devices, autonomous houses, methane generation, tide and wave power, woodgas fuel, plans, formulae and discussion.

But soft technology, as pointed out by Peter Harper of Undercurrents, is "not really about new pieces of hardware but about our whole approach to living, production, consumption, and fulfilling our goals". Peter Harper has been carrying on in the last several issues a rather introspective — but lively — comment on what soft technology is about, whether in fact it exists, should exist or is elitist. It makes good reading, like most of the subjects in this well-produced magazine.

ASE started as a newsletter, and has evolved into a bi-monthly magazine, more technical in our opinion than the British publication. Sometimes it seems that those of us without algebra or basic science are being left out in the cold, but again there is a lot to be learnt by real soft technology enthusiasts.

To ASE, soft technology is "the development of technology and philosophy for a decentralised society", for Undercurrents "radical science and people's technology", for one member of BRAD "what other folks would regard as plain labouring".

Opinions are varied about what this new science should be called. We've come across bio-technology, radical technology, low-impact technology, survival technology, community technology, eco-technology, utopian technology, appropriate technology, intermediate technology and small-scale technology, to name a few. For our part, the labels don't matter. We think these are all slightly differing aspects of the same basic endeavour.

We're happy with the definitions of "soft" versus "hard" technology given by Robin Clarke from Alternative Technology. The 35 points are ideals, all separately desirable, in practice difficult to integrate.

Robin Clarke and his wife Janine were foundation members of BRAD, the Biotechnic Research and Development community set up in Wales in 1972, but both have left the community which now calls itself "Eithin-y-Gaer", the name of the farm.

The community's huge solar roof collector (60 square metres), "glazed" with plastic sheets, has delivered 52°C hot water at the bathroom taps and has become a symbol of soft technology success. More soft technology articles follow.

SOME UTOPIAN CHARACTERISTICS OF "SOFT" TECHNOLOGY

BY ROBIN CLARKE

"HARD" technology	"SOFT" technology
1. ecologically unsound	ecologically sound
2. large energy input	small energy input
3. high pollution rate	low or no pollution rate
4. non-reversible use of materials and energy sources	reversible materials and energy sources only
5. functional for limited time only	functional for all time
6. mass production	craft industry
7. high specialisation	low specialisation
8. nuclear family	communal units
9. city emphasis	village emphasis
10. alienation from nature	integration with nature
11. consensus politics	democratic politics
12. technical boundaries set by wealth	technical boundaries set by nature
13. world-wide trade	local bartering
14. destructive of local culture	compatible with local culture
15. technology liable to misuse	safeguards against misuse
16. highly destructive to other species	dependent on well-being of other species
17. innovation regulated by profit and war	innovation regulated by need
18. growth-oriented economy	steady-state economy
19. capital intensive	labour intensive
20. alienates young and old	integrates young and old
21. centralist	decentralist
HARD	**SOFT**
22. general efficiency increases with size	general efficiency increases with smallness
23. operating modes too complicated for general comprehension	operating modes understandable by all
24. technological accidents frequent and serious	technological accidents few and unimportant
25. singular solutions to technical and social problems	diverse solutions to technical and social problems
26. agricultural emphasis on mono-culture	agricultural emphasis on diversity
27. quantity criteria highly valued	quality criteria highly valued
28. food production specialised industry	food production shared by all
29. work undertaken primarily for income	work undertaken primarily for satisfaction
30. small units totally dependent on others	small units self-sufficient
31. science and technology alienated from culture	science and technology integrated with culture
32. science and technology performed by specialist elites	science and technology performed by all
33. strong work/leisure distinction	weak or non-existent work/leisure distinction
34. high unemployment	(concept not valid)
35. technical goals valid for only a small proportion of the globe for a finite time.	technical goals valid "for all men for all time".

SOURCES

Alternative Technology, and the Politics of Technical Change, David Dickson, Fontana paperback, Glasgow, 1974, Price $1.50.

Our copy from Compendium (Sydney), 36 Burton Street, Milsons Point, NSW, 2061. Postage about 30 cents.

Alternative Sources of Energy, (ASE), six times yearly, about 60pp, from: ASE, Rt 2 Box 90A, Milaca, Minnesota, 56353, USA. $US6 posted.

ASE Book One, reprints of ASE magazine 1-10 bound, large format, 280pp. $US4.60 postpaid, same address.

UNDERCURRENTS, the magazine of radical science and people's technology, six times yearly, about 50pp, from: Undercurrents, 275 Finchley Road, London NW3, England. £STG2 posted. Back issues (from Undercurrents 4 only) are STG 35p each posted.

The Energy Primer, compiled by Whole Earth Truck Store, New Alchemy West, Ecology Action Palo Alto (USA) and Alternative Sources of Energy, $US5 from: Whole Earth Truck Store, 558 Santa Cruz Avenue, Menlo Park, California, 94025, USA. Looks like being the ultimate soft tech book. We're awaiting our copy.

Architectural Design (AD), monthly, about 60pp, from: 26 Bloomsbury Way, London WC1A 2SS, England. £STG9.40 (students £STG6) single copy $A2. Mostly building, some energy.

Whole Earth Epilog, access to tools, editor Stewart Brand (Soft Technology editor, J. Baldwin), Point, Penguin Books, 318pp. Price $A4 (recommended). Very good soft technology section with leads to publications, plans and hardware. Beautiful.

EARTH GARDEN (EG), issues 5 (wind), 6 & 7 (solar) 8, 9 & 10 (methane gas). Single copies $1.25 each, posted, from: PO Box 254, Lithgow, Australia, 2790.

Comtek Festival

BY MARGARET SMITH

Now I'm back in the Antipodes again, it's time for reminiscences.

In late August, 1974, England had a sort of mini-Nimbin Festival and I was there. Most British festivals are of the pop variety, but the Last Festival at Bath was more of a living, learning experience.

We remembered Nimbin and felt at home.

The Bath Arts Workshop co-ordinated the Last Festival, an annual festival of community arts. It was called the Last Festival because they are running out of funds.

There were three main sites scattered throughout the famous Georgian town. One of these sites, Comtek 74, was devoted to community technology. It was the first time technology was integrated as parts of the arts festival and it comprised agriculture, food, alternative technology, medicine, transport planning, housing, building reclamation and cottage industry.

The programme for Comtek 74 reads: "If one considers community based 'arts' projects such as street theatre, local festivals, rock music, poetry, folk music, painting, jewellery etc, as one side of the community spectrum then community technology is what constitutes the other side of that spectrum. It was simply a term that we thought effectively juxtapositioned technology and arts; we used it because it would be easy for people outside the field to comprehend."

The village greens of Bath looked like the old familiar village fetes or fairs, with their marquees, children and food stalls. But on looking more closely you could see that some of these marquees were actually geodesic domes, that healthy foods predominated and what looked like children's attractions were actually a windmill, solar-heating panels and an oil-drum forge.

One large marquee had a permanent exhibition where literature, hardware and photos of the groups involved were displayed. A large dome was used for films, slides and discussions. Lastly, there were workshops where people could watch and learn skills such as pottery, recycling bicycles, making forges and making shoes from old tyres.

I spent one day at Comtek, and it was quite a remarkable experience.

Community technology may still be very new, and undernourished financially but it is beginning to blossom. In England there is an amazing wealth of groups and individuals working away on projects, many of which could have enormous consequences for our high energy-absorbing and neurosis-bound society.

The Open University's film of Brad (Biotechnic Research and Development) was shown almost continually on colour videotape. BRAD is a group of nine adults and two children who set up a community in Wales 18 months ago. They are striving to be as self-sufficient as possible, to carry out research into alternative technology and to become proficient in mixed farming on a small scale.

They have built a large wooden house onto an old stone house as a communal dwelling, with a solar water heating system in the roof and a wind generator on the hillside and hope to supply all their own water needs from a spring and the generous Wales rainfall.

Professor Robin Clarke and his wife began the community. The Open University tape captured the visionary, but practical nature of the lives of these people and some of the tensions and joys of belonging to such a pioneering group.

Street Farmers of South London demonstrated an audio-visual slide presentation that could have won a prize at Cannes. Street Farmers want to give the streets back to the people — cows ate away banks and insurance buildings and grass grew back through the cement. In the slide show there was "room and food for all".

On a practical level, Graham Caine and Street Farmers have built themselves an eco-house not connected to any mains supplies. Everything is working well, except the toilet digester, where the methane production was ruined by excreta containing antibiotics. All the bacteria were killed!

On the brighter side, there is John Shore who, also in London, is perfecting toilet digesters for humans. China and other Third World countries recycle all animal and human waste as compost. John Shore is hoping to bring out a book on his successful models, so we may all one

Building a stone wall at the National Centre for the Development of Alternative Technology at Machynlleth, Wales.

day have our own privately produced methane.

CARE (Cottage and Rural Industries for the mentally handicapped) exhibited photographs of their work at the three villages they have established throughout England. Their aim is to prevent mentally handicapped people ending up in mental hospitals under sedation. Care, in their village communities, currently house about 100 people. There are communities which are largely run by the inhabitants and where they can employ themselves creatively in farming, weaving, cooking, teaching, or anything else they wish.

But there are 259,000 mentally handicapped in Britain and just what kind of lives are they living? Care's office is in Leicester and badly needs donations.

Another group devoting themselves to help the sick and handicapped was Hygeia Studios of Tetbury near Stroud. Their particular interest is in the use of colour, form, sound and rhythm to enhance our environment and improve our health. Their research has helped cure illness and some of their devices are now used by hospitals, architects, doctors, and factories.

The Colour Wall is such a device, and if shown to a person who has undergone severe shock or who is asthmatic, it will change their breathing rhythms, and bring them back to a relaxed state. There was some initial scepticism at the beginning of Theo Gimbel's talk as he recognises past masters such as Rudolf Steiner, Goethe, and Kadinski and works in an area not considered important by orthodox medicine and science, but the scepticism soon faded as he demonstrated his case and devices.

The most overwhelming contribution to Comtek 74, were the exhibitions of alternative technology projects. A group of university students showed over 100 slides of solar energy collectors they had found operating successfully in England — about one quarter of these heated swimming pools.

ITDG (Intermediate Technology Development Group), head office in London, are a charity in close link, with many universities, working on intensive-labour simple technology for Third World countries, that doesn't cause the unemployment problems of capital-intensive technology. They are currently doing research projects in Brazil, Canada, Ethiopa, Ghana, India, Iran, Nigeria, Pakistan, Tanzania and Zambia.

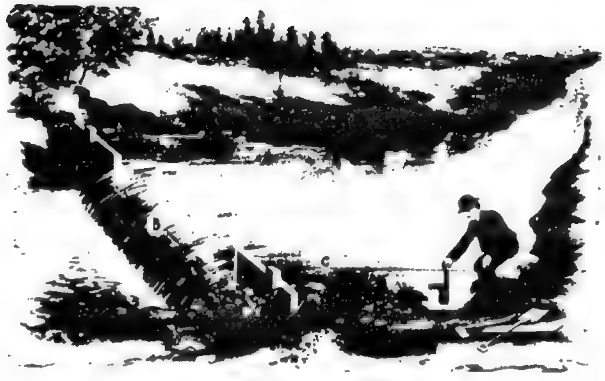
Low Impact Technology, situated in Wadebridge, are producing instruments such as fireless cookers for sale to the community. And so the list goes on.

Community Technology may be a new and struggling science for the common man, but it is also an amazingly vital and energetic activity to save this island and mankind, in a country that is said to be "slowly sinking under the sea".

One theme which kept being raised at Comtek 74 was whether the aim of community technology to change people's lifestyles, should just be considered an end product. It has to be part and parcel of the ongoing process and this is where the age-old problems of love and human fellowship enter.

Some groups like Divine Light Mission and Transcendental Meditation at Comtek 74 were offering meditation as the way to make individuals stronger in themselves and more sensitive to others.

BRAD, in particular stressed that community technology is no panacea to save mankind on its own unless it goes hand in hand with greater human awareness of the needs of mankind, and the evolution of a more spiritual and harmonious human being.



Measuring water by the weir method.

Water measurements should be taken at the driest time of the year. In small streams a simple way of doing this is to build a small temporary dam. Channel the water into a pipe or catch it in a bucket of known capacity.

Use the second hand of a watch to work out how many cubic feet of water are available in a minute (minute cubic feet).

Medium sized streams may be measured using the weir method. The illustration above shows the way this works, but on a slightly larger scale than most people will need.

The weir is made from boards, logs or timber scraps, chinked firmly with clay to stop leaks. This forms a small pond upstream from the weir. The width of the weir B, should be about six times the greatest depth of water flowing over it.

A wooden stake is driven vertically up stream several feet above the weir so its top will be exactly level with the bottom edge of the notch in the weir.

When all the water is flowing over the weir measure the depth C over the top of the stake, then read the weir table which gives the minute cubic feet of water one inch wide flowing over the weir. Multiply by the width (in inches) for the total volume rate of flow. Source: Pamphlet 'A', James Leffel & Co.

Table Giving Minute Cubic Feet of Water 1 Inch Wide Flowing Over Weir

Inches Depth C Over Stake		⅛ Inch	¼ Inch	⅜ Inch	½ Inch	⅝ Inch	¾ Inch	⅞ Inch
1 Inch	.40	.47	.55	.65	.74	.83	.93	1.03
2 "	1.14	1.24	1.36	1.47	1.59	1.71	1.83	1.96
3 "	2.09	2.23	2.36	2.50	2.63	2.78	2.92	3.07
4 "	3.22	3.37	3.52	3.68	3.83	3.99	4.16	4.32
5 "	4.50	4.67	4.84	5.01	5.18	5.36	5.54	5.72
6 "	5.90	6.09	6.28	6.47	6.65	6.85	7.05	7.25
7 "	7.44	7.64	7.84	8.05	8.25	8.45	8.66	8.86
8 "	9.10	9.31	9.52	9.74	9.96	10.18	10.40	10.62
9 "	10.86	11.08	11.31	11.54	11.77	12.00	12.23	12.47
10 "	12.71	12.95	13.19	13.43	13.67	13.93	14.16	14.42
11 "	14.67	14.92	15.18	15.43	15.67	15.96	16.20	16.46
12 "	16.73	16.99	17.26	17.52	17.78	18.05	18.32	18.58
13 "	18.87	19.14	19.42	19.69	19.97	20.24	20.52	20.80
14 "	21.09	21.37	21.65	21.94	22.22	22.51	22.79	23.08
15 "	23.38	23.67	23.97	24.26	24.56	24.86	25.16	25.46
16 "	25.76	26.06	26.36	26.66	26.97	27.27	27.58	27.89
17 "	28.20	28.51	28.82	29.14	29.45	29.76	30.08	30.39
18 "	30.70	31.02	31.34	31.66	31.98	32.31	32.63	32.96
19 "	33.29	33.61	33.94	34.27	34.60	34.94	35.27	35.60
20 "	35.94	36.27	36.60	36.94	37.28	37.62	37.96	38.31
21 "	38.65	39.00	39.34	39.69	40.04	40.39	40.73	41.09
22 "	41.43	41.78	42.13	42.49	42.84	43.20	43.56	43.92
23 "	44.28	44.64	45.00	45.38	45.71	46.08	46.43	46.81
24 "	47.18	47.55	47.91	48.28	48.65	49.02	49.39	49.76

The human unit

BY PATRICK F. HOWDEN

As most of our basic NEEDS and RESOURCES relate to water, this issue of EARTH GARDEN came just in time. So many folk have offered help, and asked advice on how to design their own Eco-house, that I am dedicating these comments to them.

The only way I have been able to make head or tail of the massive amount of conflicting data on autonomous life-support bio-cycles, has been to introduce the concept of HUMAN UNIT SYSTEMS ... then to configure an ecological plumbing arrangement on a DAILY PER CAPITA basis, as if only a single person had to be self-supporting. Wait for some surprises.

In terms of LIVESTOCK UNITS of equivalent digestible manure, humans shape up as: 1 cow = 1 horse = 6 pigs = 20 sheep = 24 humans = 100 chickens. That enables you to scale up the hardware economics for any size family or farm.

I can't possibly quote all the alternative (or professional) library sources, as many have huge credibility gaps. Certainly experiments in these vital areas should be set up to check my figures before we know if we and the Third World can be saved from energy and food starvation.

WATER: Figure 1 shows the collection, storage, solar (or contingency) heating, distribution and drainage of roof rain water in litres. Note the small solar panel size for heating the needed amounts of water.

If you want to live as the average non-conserving city bod, water volumes and heating will have to be quadrupled. The three litre daily toilet flush is a carefully measured quantity for the anaerobic digester, however.

WASTE RESOURCES: There's an awful lot of waffle written about handling water and wastes, after they leave us, in methane digesters. Few agree, and less are credible, in this extended state-of-the-art field. I've tried to dig up reports stretching all the way from prewar to nuclear submarines and planned space probes, WHO sources and Taiwan rural history. It **seems** that Figure 2 represents the best agreement in design on a daily per capita basis.

Seems like a lot of building, level planning and maintenance; but not much at all really, considering you don't have to go to work to pay for your dinner. Trash technology, polythene sheet and cut-up plastic pipes will reduce costs. Some sections, such as algae or fish, can be left out, or combined with partitions.

Collection of methane from a human unit is not a big objective as it would daily drive a car only two kilometres. It might just handle very conservative cooking needs, drive a tiny engine battery charger, or simply maintain heat in the digester.

Communal and farm energy usage and cooking would help generate and use the methane effectively.

One of the miracles of life is that the whole system shown for the safe treatment and recycling of one human unit waste (not including other livestock or crop spaces) is only a square with sides of six metres!

For that you get 3.1kg of organic salads and vegies, 0.9kg of fish, 1.6kg of algae, some grasses, grain, fruit, shellfish and compostables each day in the form of slowly accumulating digester sludge and inedible sections of garden plants, algae etc.

Now scale all this up proportionally for several people and animal wastes, using the algae water to scrub CO_2 from the bio-gas, and you have a real gold mine.

There doesn't seem any other neat way of recycling nutrients without losses. It's a matter of being clever with tank and hardware design. Other stock worth considering for their efficiency, breeding rate and use of scraps and grass as fodder include goats, geese, ducks, rabbits, guinea pigs, worms and snails. Try feeding worms kitchen scraps on straw bedding. Catfish then thrive on the worms.

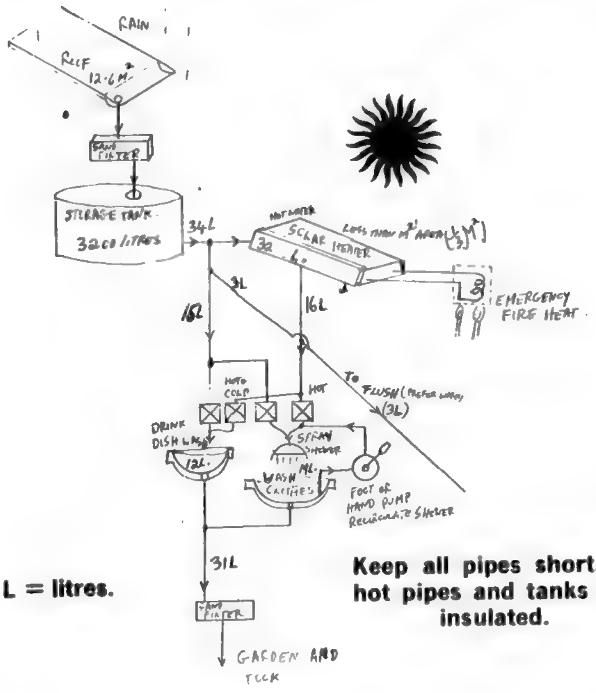
OTHER ENERGY: That hardly solves the problem of energy conversion and storage for cooking, refrigeration, light and transport, or auxiliary power. It all depends on your resources.

Starting with light and in the absence of a water wheel, try a wind generator (say an air turbine as mentioned in EGIO). You will need about .36KWH lights, possibly electronically dimmable 12 volt halogen or fluorescent.

If you can count on a 12-knot wind for ¼-day average, the mill area to produce the 60-watts battery-charging will be only ½-square metre.

Refrigeration can usually be replaced by other forms of food preserving — solar drying, salting, stewing, smoking. Otherwise you are

FIG 1: PROPOSED WATER COLLECTION, HEATING, STORAGE AND WASHING ON A DAILY PER CAPITA BASIS.



L = litres.

Keep all pipes short. All hot pipes and tanks well insulated.

P. Howden '75.

in for quite a high technology.

Cooking energy for the human unit is available from several sources. Our searchlight mirror solar fried eggs in a few seconds. It also punched a hole in a beer can at the focus. A much cheaper plastic Fresnel lens likewise — about ½-metre square area is needed ... same as the mill.

You can store the solar heat in high temperature oils, or cook in the day and store the food in a big thermos, or cook stews for three hours with boiling water in the thermos.

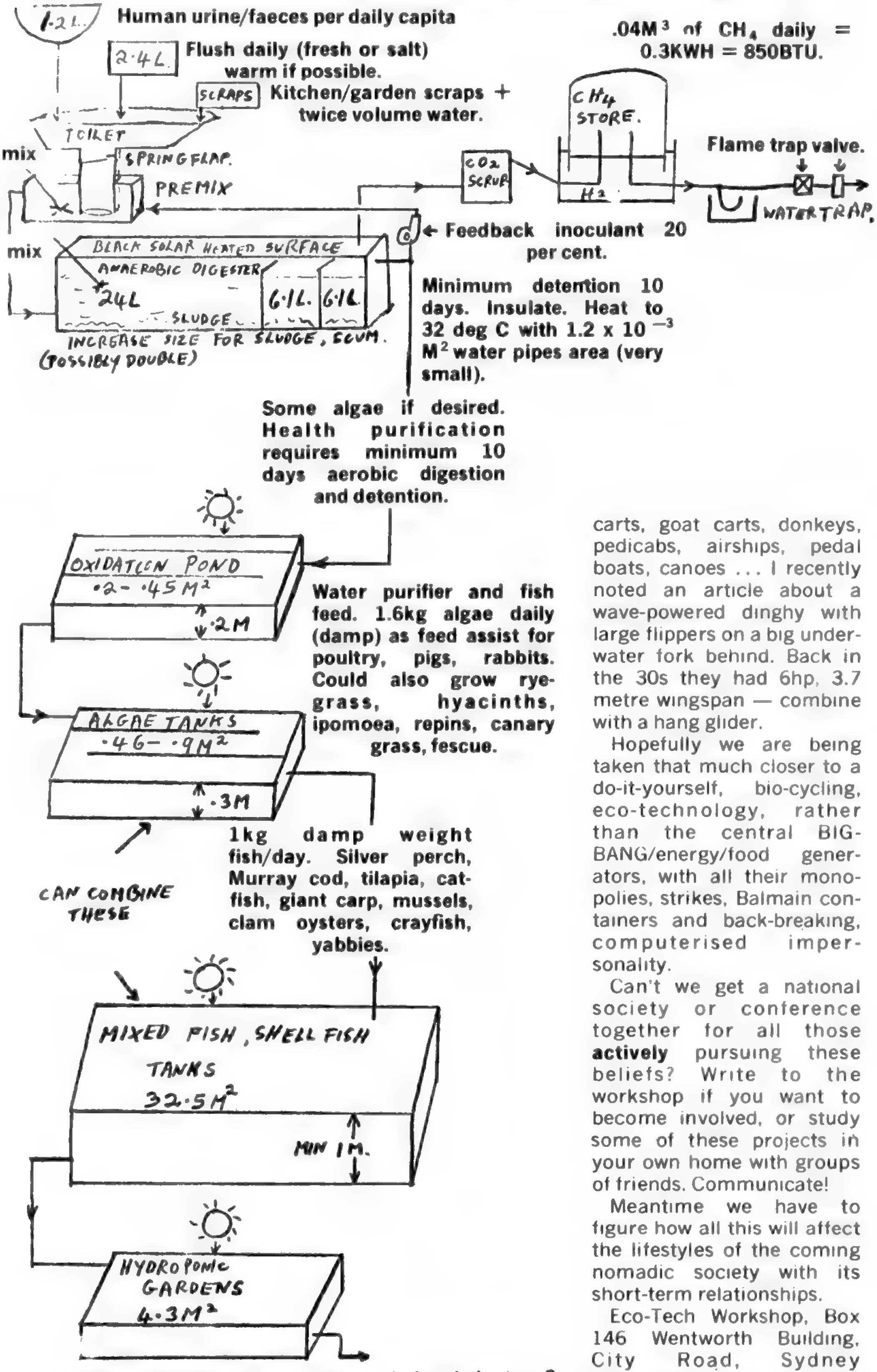
A small rubbish burning stove (EGIO) is probably the safest bet, if you don't want to get a kilowatt windmill.

TRANSPORT: Regarding transport, an overlooked possibility is the old wartime suction wood or charcoal gas producer. I found a 1939 "Sun" newspaper, which said that all the charcoal left after a bushfire (as recently) should be collected to feed the gas producers for motor vehicles or boats! You could store such rich fuel gas in your methane tank with a small compressor run from the windmill battery.

A producer gas package can run a standard internal combustion engine for pumping, electricity, wood cutting and transport. A wood-burning gas motorcycle, anyone? The producer gas needs to be cooled, so you cook and get free hot water.

Meanwhile if you could compress this gas (or town gas) into bottles at 3000 pounds per square inch, you could run your MOPED (1/3-horsepower pedal-assist bike), and car on the equivalent of cents per gallon. Depending on the type of gas (bio-gas, methane, natural, town gas) you get anywhere from two to eight gallons volume of compressed gas equivalent to one gallon of petrol.

FIG 2: HUMAN LIFE SUPPORT SYSTEM (approximate configuration).



Human urine/faeces per daily capita

Flush daily (fresh or salt) warm if possible.

Kitchen/garden scraps + twice volume water.

.04M^3 of CH$_4$ daily = 0.3KWH = 850BTU.

Flame trap valve.

mix

mix

← Feedback inoculant 20 per cent.

Minimum detention 10 days. Insulate. Heat to 32 deg C with 1.2 x 10^{-3} M^2 water pipes area (very small).

Some algae if desired. Health purification requires minimum 10 days aerobic digestion and detention.

Water purifier and fish feed. 1.6kg algae daily (damp) as feed assist for poultry, pigs, rabbits. Could also grow ryegrass, hyacinths, ipomoea, repins, canary grass, fescue.

1kg damp weight fish/day. Silver perch, Murray cod, tilapia, catfish, giant carp, mussels, clam oysters, crayfish, yabbies.

3kg/day vegetarian fare — more than enough to feed one person.

Could help irrigate 3 square metres earth garden if freshwater flush used.

P. Howden '75.

And then there are bikes, sailboats, roller skates, dog carts, goat carts, donkeys, pedicabs, airships, pedal boats, canoes ... I recently noted an article about a wave-powered dinghy with large flippers on a big underwater fork behind. Back in the 30s they had 6hp, 3.7 metre wingspan — combine with a hang glider.

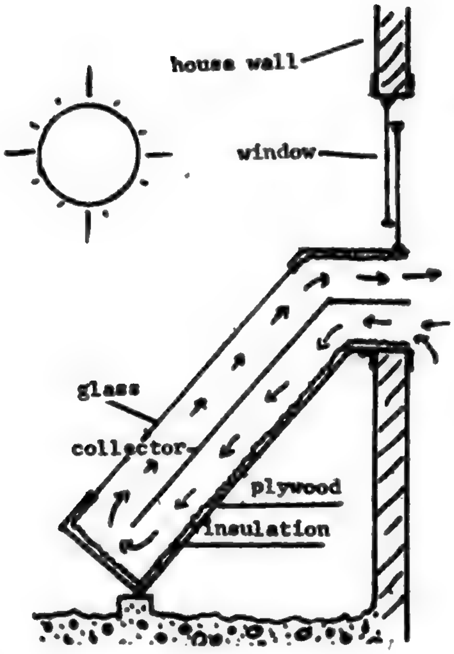
Hopefully we are being taken that much closer to a do-it-yourself, bio-cycling, eco-technology, rather than the central BIG-BANG/energy/food generators, with all their monopolies, strikes, Balmain containers and back-breaking, computerised impersonality.

Can't we get a national society or conference together for all those **actively** pursuing these beliefs? Write to the workshop if you want to become involved, or study some of these projects in your own home with groups of friends. Communicate!

Meantime we have to figure how all this will affect the lifestyles of the coming nomadic society with its short-term relationships.

Eco-Tech Workshop, Box 146 Wentworth Building, City Road, Sydney University, Darlington, NSW, 2006. Workshop at 162 City Road, opposite Sydney University.

Solar Space heaters



This simple but efficient solar space heater works on the "U-tube" principle familiar to school science students.

It uses convection currents. Hot air rises because it's lighter and pushes out cold air, so that a flow of air is generated.

It does not store heat, but it will cut fuel bills in cold areas, where it could eliminate other types of day-time heating. It doesn't work at night, so normal heating is still needed.

The unit fits into a ground floor window facing north (or slightly north-east for an earlier start), the way you would instal an air-conditioner. It may be removed easily in summer.

It's an insulated box, which may be made of plywood or particle board. One end of the box is angled through the window and into the room you wish to heat. Outside the box slopes down towards the ground.

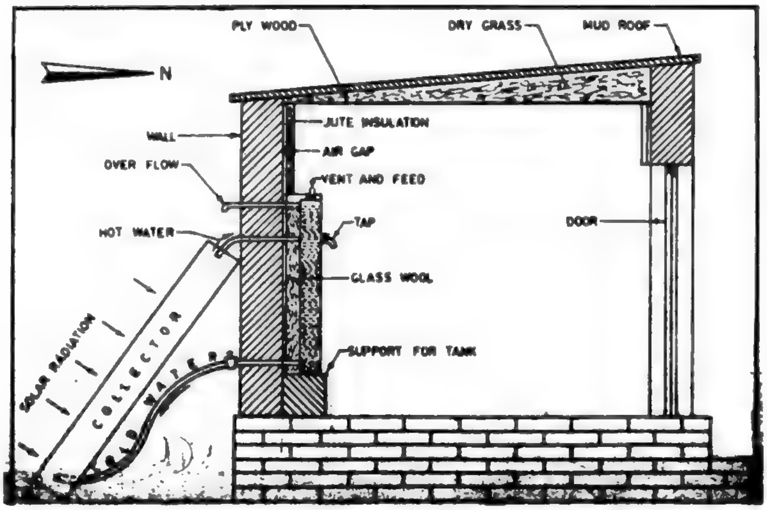
The top of the collector box is faced with glass. Inside it is divided into upper and lower channels by an absorber, except for the last 10 or 12 inches at the ground. The absorber may be made of a plate of blackened sheet metal, insulated thinly on the underside with felt.

Measurements are flexible. The collector may be as wide as your window (usually about 32 inches) with air channels about four inches deep. The layer of insulation need only be about an inch deep. You can use styrofoam, steel wool, fibreglass or cork.

The solar space heater was developed in the United States by T. (Buck) Rogers, who uses it to heat his adobe cabin 6000 feet up a mountainside at Embudo, New Mexico. It was described in Alternative Sources of Energy magazine, Nos 13 & 14.

When the sun is shining, air in the upper channel is heated and begins to rise, drawing in cool air from the room, which also becomes heated — and so it goes. When the sun isn't shining, no air flows through, so consequently no heat is lost.

We suggest that all areas around the window be well insulated.



Storage of heat is an added feature of this solar space heater developed by J. P. Gupta and R. K. Chopra of the Defence Laboratory at Jodhpur in India.

It is also intended for use in high altitude conditions, where there is cold air but clear skies.

Warm water passes through a flat-plate collector by natural thermo-syphon, then through the outside house wall to a tall, thin, rectangular storage tank inside.

The back of the tank is carefully insulated. Heat radiates from the front of the tank into the room. The unit was tested at an altitude of 3.5km under sub-zero conditions (air temperature down to -20 deg C). Anti-freeze was put in the water.

It heated a living room 3.75m by 2.40m by 2.40m as satisfactorily as comparable rooms heated by electricity or kerosene.

Source: Architectural Design (AD) magazine, October, 1973.

Note: A similar space heater in Australia should not need to use poisonous anti-freeze, so heated water should be available from the tank. In the southern hemisphere, of course, the collector and tank would be positioned on north or north-east walls of the house.

earth people write:

Dear Irene & Keith,

We have for the past 3½ years been trying and planning to get some land and get back to nature and make ourself self-sufficient. We started with ten, now we are five, ageing from a super granma down to youth.

It's been hard and along the way it often felt as though it would never happen. About 1½ years ago we were able to buy 13½ acres of natural, never-been-touched bushland along the coast north of Brisbane.

We have no electricity or any other amenities, and have often found, and are finding, helpful hints from EG. One such hint was from EG3 "Push-bike pump" (page 51). Instead of a pump we connected same to an old, small tub Hoover washing machine. Four minutes pedalling and you have a load of snow white washing.

After we finish washing we empty the water into our garden by the pump in the machine.

Getting back to nature is hard at first in making the break and then there's lots of hard work getting things going, the gardens etc. In six months we now produce 60 per cent of our food.

The Peace and Joy you can find living with nature makes all the hard work and the struggle to get here worthwhile. If anyone would like to write to us, we would be happy to hear from them.

Peace is the natural state of Man.

It is harmony, silence, calm, repose, rest.

Cherrilyn, Elizabeth and all at "Elahin", M/S 1276, Lot 42, Wusts Road, Doanan, via Eumundi, Queensland.

Dear Friends,

I was introduced to EARTH GARDEN by my children. I have always been a gardener who rarely used chemical fertilizers, but who used chemical sprays. But I tried the garlic spray on an azalea plant which had various "wogs" on it (at the same time my neighbour sprayed the conventional way — my azalea is green and lovely now (but hers is still sickly).

Also here's a tip for other "nuts" who spin and use wool for various rugs etc. I made a rug by sewing the skirtings on to canvas and then wondered how to clean it (friends say they send theirs to the dry cleaners). In desperation I tried "Glory" carpet shampoo — which was a success (plus). So I tried washing the skirtings before sewing and have quite a bit of wool ready for the next spurt of inspiration.

Good luck for the future and thank you for a wonderful magazine.

Yours sincerely, Wyn Drew, Toowoomba, Queensland.

Dear Irene and Keith,

The only hint I could think of relating to the forthcoming "water" issue concerns the older types of canvas tents which often leak from worn spots in the roof. Simply trace a line with your finger from the drip, down the inside of the tent roof to the edge and the water will follow. And remember, never touch the inside of the tent roof during a storm.

I am presently completely restoring a sulky and would appreciate getting in touch with people of similar interests. There seems to be quite a few remains of such vehicles about, often for the asking. But the selection of the right type of wood, especially for shafts, is a definite problem.

Yours, Graeme Whan, Flat 1, Bank Court, Hyde Street, Bellingen, NSW, 2454.

Dear Friends,

Coming back to the land is not, repeat not, to be undertaken lightly; this is Australia not Arcadia. The countryside is an economic slum, with most farmers barely scratching along — if their wives can get jobs in the nearest township.

Intending migrants from suburbia should carefully consider what saleable skills they can bring along in their hands or minds. Like it or not, virtually every nail, screw and yard of wire has to be paid for with **money,** and decorated leather belts have a very low exchange rate at my local Wesfarmers Store.

Other illusions evaporate faster than hot sweat. Hopefully, one day, I shall return to a sensible diet, but in the meantime a .22 rifle is the only realistic way I have of enjoying most of my vegetables — at secondhand — after the rabbits have burrowed under the fence, or vaulted over the top, or whatever.

Despite all this, is it worth the move? Yes, any number of times, yes! **Love and peace, Mike Talbot, Leederville, Western Australia.**

Dear Keith and Irene,

We have a 32-acre farm and we need all the encouragement we can get to turn the mostly bare land into bush and orchards and gardens.

We have been at it for a year now and have planted hundreds of trees. We have made the mistake of planting so much that we can't look after them all properly. As a result some have died.

The native trees don't need much looking after, but the fruit trees suffer from the weeds and drought. So for a while I think we'll stick to looking after instead of planting. We have been finding it helpful to read about other Earth Gardener's experiences and it's great to know we aren't the only ones who have failures.

Livia, Peter and Timothy Foley, Kandanga, Queensland.

Dear Irene and Keith,

With so many of your readers striking out in their own bush havens, I write about a problem that is becoming more and more acute.

We live at Cape Nelson, which is a truly magnificent Cape, due south of Portland in Victoria. It is an interesting area ecologically as it is the largest area of mallee (euc diversifolia) growing on the coast of Victoria. The other areas are small and isolated, and of little significance.

Due to the proximity of the sea we never have a forest, and as a result the mallee flowers out of season in the winter. The importance of this is of course that it is a very important food source for the honeveaters. There are eight different varieties here at the moment. It is our idea to turn the whole of the Cape into a sanctuary, with the 700 acres of scrub remaining undeveloped, some of it being owned on a cluster-development basis, instead of farming it. The area would have strict covenants on it, one of the most important being "No Cats".

Do your readers realise what tremendous damage these feline creatures do when homes are set up in the scrub? A very large proportion of Australia's bird population feed on the ground or nest in the low branches of trees. They are totally unable to cope with cats.

Here, as we are only seven miles from Portland, the problem is becoming acute, partly due to "kind-hearted" people dumping kittens. This is happening to such an extent that I am forced to shoot any stray cats. The area was once rich with the call of the bristle birds; now they are rare.

We have two partial solutions to the problem: (1) The registration of all cats; (2) The setting up of free humane killing centres in local towns. Any other ideas would be greatly appreciated.

We have a Cheviot flock here, which is, as you probably know, the wool used in the spinning of Harris Tweed. I sell wool by the pound/kilo if any readers are looking for it. It spins very well, so we are told.

Yours sincerely, David J. Peddie, Cape Nelson, Box 240, Portland, Victoria, 3305.

STARTING WITH HENS

BY GLENEVIE JENSEN

After writing to you last time (see Feedback on fowls: EG8), I got to thinking about those who are beginning to get interested in keeping a few hens.

I though perhaps it would help them if someone could relate simply a few details about starting. To those of us who manage our own fowls, some simple facts and rules seem so obvious that they are unimportant. But to the beginner the whole idea of keeping fowls can appear difficult.

Nothing could be further from the truth. At the most, laying hens take 20 minutes of your time each day. And if you use your head and keep a few more than you need, the surplus eggs can be sold to neighbours or workmates and results in paying for the feed.

This means that you have as many fresh and top-quality eggs as you need — for nothing. I sell mine for 50 cents a dozen, and usually cannot keep up with the orders.

Fowls can be kept successfully in a backyard, but you must be prepared to let them out to pick for at least three-to-four hours a day. I let mine out from about 9 am until they go to roost at dark, which is better, if possible.

This is best done when you are at home, as stray dogs can wander in and slaughter the lot, if they are left unattended. This also means that your vegetable patch must be protected, preferably enclosed, as fowls don't agree with the share-and-share-alike principle.

You must begin with your coop. I will describe ours to give you an idea, but I must point out that we have a huge double allotment, as well as the one our home is built on, so a smaller area would mean building a smaller coop.

Bryan began by laying a square of cement, 12 feet by 10 feet, which was to be under the roosts. This makes the regular collecting of manure easy. This area was covered, making a seven foot high shed. Bryan has drawn a diagram to help me describe it.

One shaded area is the shed. You will notice that it is divided, by wire, to shelter the roosts of two pens, one for adult fowls, the other for chickens. Also Bryan has made an enclosed area for our garden patch, down-slope from the pens. He planned it that way, so that any extra manure would wash down into our vegetable garden when it rained.

The double lines show the sections enclosed by fibro. It is a pretty open sort of design, but on their high roosts, the birds remain dry and comfortable. The chicken coop is completely covered by wire, as protection against chicken-hawks, kookaburras, butcher birds and cats. It also has an extra width of small chicken wire all around the outside, at ground level (the gate too), to keep them in.

When you have your fowl run completed you will want to see something for your efforts. A quick way to have eggs on the table is to enquire at any local hatchery at moulting time (Autumn).

These places only keep their layers for one year and then slaughter them for meat. I bought moulting hens for 60 cents each, two years ago, and they are still going strong.

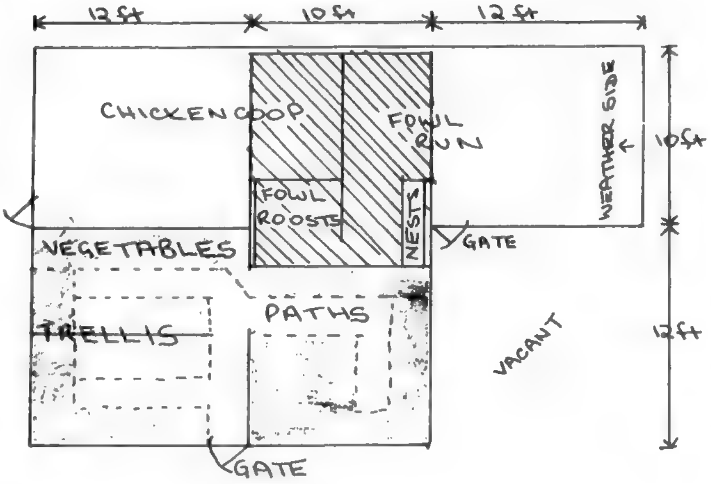
However, these birds have nearly always been immunised, and hearsay has it that antibiotics, and even detergent, is added to their feed. For this reason it is better to raise your own, but you have to start somewhere, and if your are lucky enough to know of some farm that practises free-range methods, then go no further.

The hatchery birds I bought had been cruelly de-beaked, to such an extent that the beaks have never grown back to proper size. The reason for this, I was told, was because of their picking and damaging other birds severely. An interesting aspect of this is that I have never met with such peculiar behaviour with my range-fed birds — not to the extent of them maiming one another.

Because they had been de-beaked, they can only pick up a little of the mash in the morning, and no grains at all. So, in the afternoon, I separate them. This isn't hard as they have become used to the routine and follow me into the pen, after I throw grain to the others. I then leave them a feeder, filled with half grain and half dry all mash, for half an hour.

When I first brought them home their claws had

The fowl pen and enclosed vegetable garden.



grown to three and four inches long. This was because the poor brutes had never been allowed to scratch. I was tempted to cut them back, but thought better of it, feeling that they would wear them back eventually, which proved to be right. I locked them up for the first few days, which was to allow them to get used to their new home. However, I needn't have bothered, as when I tried to let them out they wouldn't go and I had to chase them out repeatedly, to introduce them to green grass and insects. Pathetic.

Hatchery chicks are a poor risk and our experience has been that, even with the very best of care, you are lucky to raise half of them to maturity. They seem to be weak from the start. In contrast we seldom lose any of our bantam-mothered chicks. However, if you try raising chicks, remember that, with no mother to keep them warm at night, they will die from the cold. So, up until they have all their feathers, at six weeks, you will have to collect them at dusk, in a box, and keep them upstairs, or in some enclosed place — near a combustion stove is ideal.

I keep a few bantam hens, because they are such marvellous mothers. Not the pure breeds, just the common little cross-bred. You may wonder why most hens won't go clucky, or having started, leave their eggs before they hatch. The reason is simple, and a good lesson — the breeds which have longest been subjected to unnatural breeding (incubators) and feeding are the birds which become perverted to the extent that they cannot even mother their young. Civilization has robbed them of one of the strongest instincts for survival. If only we could observe that the same thing is happening to us — but most EG readers understand this already — hence the movement back to a more natural way of life.

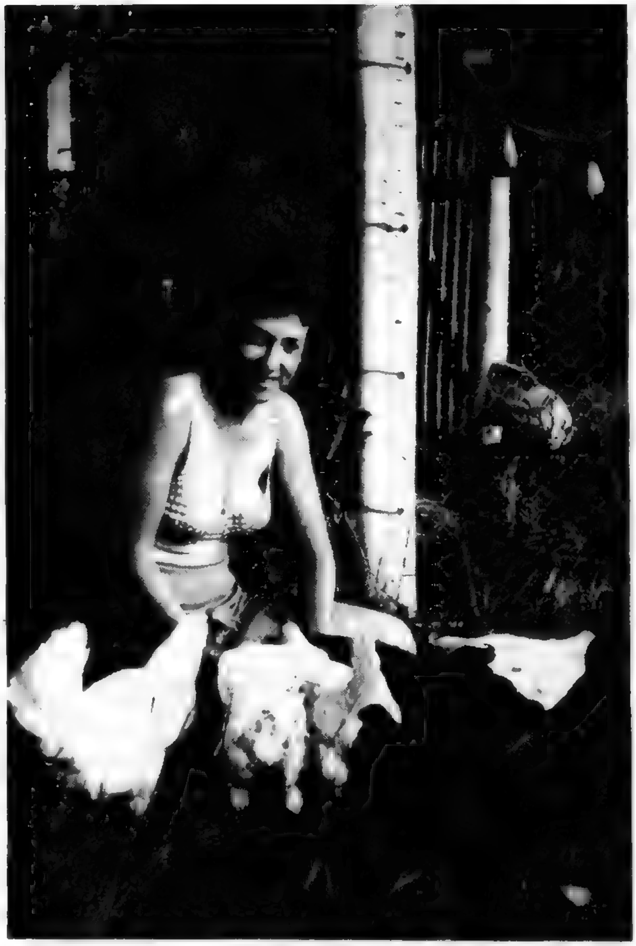
If you are interested in raising your own chicks begin by penning the bantams separately in the chicken coop. Last year's chicks would by now be pullets, beginning to lay, and ensuring eggs for your family while the others are moulting. Prepare a nest, an ordinary wooden fruit case turned on its side, reinforced on the bottom, and with one piece of light, flat wood across the bottom-front to contain the nest and prevent eggs or chicks from rolling out.

Raise it slightly from the cement, on straight bits of wood to keep it perfectly dry. By only letting the bantams out to pick after dinner, you will get them used to laying in this nest. This is something of an achievement, as bantams are most contrary and insist on hiding their eggs in inaccessable places. If a hen does go clucky on such a nest, you can transfer her to your protected spot, but this requires low cunning and much care on your part.

Shift her at night, with the sparing light of a torch and drape the entrance of her new nest with bags to fool her. They love privacy. All this is unnecessary, of course, if they become accustomed to laying in the chicken coop. I always fill the nests with fresh shellgrit. Laying hens can have it as often as they want, and are not tempted to eat their eggs. If it forms the base of your broody hen's nest, salt in the shellgrit will discourage fowl lice.

Incidentally, if you find some of your hens with yolk on their beaks and feathers, it doesn't always mean that they are deliberately breaking their eggs to eat them. Very often the heavy hens accidently break them, and then, scavengers that they are, will eat them up.

Back to our bantams. Don't forget that all-important plastic egg that completes any nest. Now buy a healthy rooster and allow him to run with your layers. The important things to look for are a bright red comb and clean hindquarter feathers, free from manure. Also check if the bird's legs are gnarled and scaly — this shows that he is on old fellow, and might be past it. Choose one with clean, shiny legs.


Glenevie and hens.

The best time for all this is after your hens have recovered from moulting and you are enjoying the first flush of eggs. By this time it is winter and, again, the cooler weather cuts down on lice, which can be a major problem. Your rooster has to be running with the hens for at least a week before the eggs are fertile. You can then collect them and keep them in an airy place, at room temperature, for up to five days, and the chicks will still hatch together.

A clucky hen is ready for eggs when she sits on the nest at night, instead of going to roost with the others. A bantam can usually accommodate seven eggs. At this time we usually kill and eat the rooster and return the other bantams to the fowl pen, leaving the sitting hen in the chicken coop by herself.

When she gets up to feed, place a little soft, dry grass on top of the grit and replace the eggs. This makes a nice, soft bed for the babies. Cover the front and top of her nest with odd bits of iron sheeting to protect her should a storm blow in rain.

Now mark your calendar three weeks from the day she started sitting. If you peep in one day before the time is up you will find her very cross and resenting your interest. Chances are that one or two chicks are out and the other eggs cracked or whistling.

Prepare a shallow water container, with rocks to provide a foothold for the chicks to prevent them drowning. Buy some Hypro, as this, given dry and kept continually before them, will be their feed up to six weeks of age. Also secure a piece of wide, flat wood, with small bits nailed across, from the nest entrance to ground level, as a ladder for the chicks.

When mother takes them out for their first walk (or before if the lice are really bad), completely change the nest and shellgrit. The lice have had three weeks to breed and it is important to do this.

However, don't disturb the hen during the incubation period, or she might get upset and refuse to return to the nest. It's better done when the chicks have hatched.

I must admit that this is a rotten job and one that I pass on to Bryan at the first opportunity. I'm scratching just thinking about it! Another good idea, as long as the days are warm and there is no risk of wetting the chicks, is to water the ground in the coop regularly. The problem usually solves itself in a week or so.

Now, as well as the Hypro the chicks need their greens. After weeding your garden throw the greens to them. Mother will sort out what is good for them. They particularly like thistles, lettuce and silver beet. In fact it's a good idea to plant a few extra seedlings especially for them.

I lock up our two cats and let the hen and chicks out for an hour or two every day. However, it's only when we are working downstairs, or when our two boys are home and can play near them, and watch for stray cats or winged predators.

When they are about three weeks old mother will want to teach the chicks how to roost. Again, make a ladder, with rungs about nine inches apart, to reach the first perch. If the weather is particularly cold, dismantle the roost and she will go to the nest with them until they are a bit older and are better covered with feathers (at about six weeks). At this time the hen begins to lay again and, with this, her devotion to the chicks ends abruptly. She will pick and persecute them until you return her to the other hens.

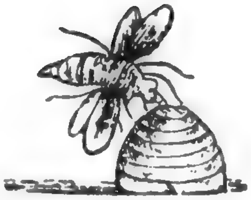
At six weeks you can start feeding them chick-feed and growing mash, which is best mixed dry and given in galvanised feeders. Leave it constantly in front of them until they are three months old. They can then run unsupervised with the others. They begin to lay at about six months.

I set one clutch of eggs a year like this and it usually provides us with enough pullets. Sometimes you can get more cockerels than you want, but they do provide wholesome meat at four to five months old.

You will find that your bantams go clucky very regularly and can be a nuisance on the nest at times. Pay no attention to people who tell you to half drown them in a bucket to solve this problem. This sort of method is cruel and unnecessary. Just confine the hen to the spare coop, without a nest, and within a week she will be back to normal.

One last hint: try to buy your feed in bulk, and store it away from mice in clean plastic rubbish bins. This works out considerably cheaper. A word of warning: stock feed distributors often salt their grains with poisonous insecticides to kill weevils, so if you know of a flour mill in the district, it is better to enquire about clean milling wheat, which has been washed.

Well, happy fowl keeping. With the price of eggs continually rising, you will find it well worth your while.



bees & ducks

BY PEG KINNISH

WARNING: Don't put ducks and bees too close together as ducks tend to eat the bees. Then the bees bite the inside of the duck — duck swells and, hey presto — Dead Duck!

Young ducks seem attracted to eating bees.

Don't allow young ducks into water. They get too cold and get a cramp.

Result — dead duck!

Once they have feathers and their oil valves are working (about three months), it's safe. I saved some cramped ducklings by putting them into a warm oven.

A sudden shower of rain can cause ducklings to die too. They should be protected from the rain if no mother duck is about.

Beekeeping is interesting, interrupting, fun, annoying, messy, time-consuming and challenging in the first year and, I hope, eventually profitable.

Spring swarming: Having fed the brood loyally all winter they shot through. I chased and boxed them several times all over Koonwarra. Disloyal horrors!

I've successfully caught four other swarms and am now ready for reuniting. An interesting side issue from all this is that our four children have no fear of bees. To my horror they will often just pick one up in their bare hands and bring it to "show" me . . . and not get a bite. They ask: "Is this one of **our** bees, Mummy?"

I have always tied up the dog and told him to get out of the way if I'm working with the bees — a good safety measure.

A good place to get ducklings (Khaki Campbells): Mahoney's Duckling Hatchery, Devon Meadows, Victoria, 3977.

This man has **beautiful** bio-dynamic oranges, I've had several boxes: Bill Underwood, PO Box 119, Barham, NSW, 2739.

* * *

Beeline Apiaries, mentioned in EG10, have shifted to: Factory 11, 21-23 Capella Crescent, Moorabbin, Victoria, 3189. Telephone: 95 7021.

more letters

Dear Keith and Irene,

We are new land settlers. We drew our block 10 years ago and moved here 14 months later. The block is 3700 acres and we have cleared, fenced and pastured about 2000 acres of this and have crops and about 2000 sheep.

Before we came we had some cleared, but we found it was a mistake to clear all the mallee scrub, so our later clearing has left belts of scrub and scattered trees for protection of sheep and soil.

We have been living in one unlined end of a shed, but we hope to move soon into a natural stone extension my husband has built. The stone is quarried about 50 miles from here, not far from the coast and comes in lovely shades of pink and natural colours. They say it was sponge-like when under the sea and later hardened when exposed.

Best Wishes for the future, Barbie Page, Ravensthorpe, Western Australia.

Dear Keith & Irene,

I am becoming a source of information on herb growing in Australia. If any of your readers have had practical experience growing herbs and would let me know their experiences I would be very grateful. I am also keen to help anyone thinking of starting herb growing with information, seed sources and plants where possible.

Love and Light, Dave Dane, 42 McWilliam Street, Gordon, NSW, 2072.

Dear Irene and Keith,

I stumbled on to your book after hearing two women arguing about EARTH GARDEN at a meeting I was attending, made some enquiries around the bookshops and bought one. Cheers! What welcome news it was to find other people doing what we have been doing all our married life.

You see we have both been on an Invalid Pension since we left school, and we have had to supplement our income by all means possible. Four years ago we were able to buy a 100-year-old house which didn't need much doing to it, with a wonderful old double garage and a big block of land which has enabled us to grow most of our vegetables in the ground ... instead of in old troughs, large pots or anything that would hold earth. Tho' we still grow our tomatoes in four gallon drums and potatoes in our daughter's old six-foot paddle pool filled with pine needles, which has been quite successful.

We also had two ducks and a drake until they adopted our next-door neighbour when a paling fell off the fence, so we only see them now and again. We share any eggs, which are few now as the ducks are getting a bit old and we haven't the heart to replace them as our neighbour is so fond of them.

This year we were able to get to work on the old garage. It now stands resplendant with a new roof, fully lined and covered with wallpaper — a suitable place to house my three looms, spinning wheel and fleece yarn.

Les and Nini Baxter, Brighton, Victoria.

Dear Irene and Keith,

I am following a macrobiotic diet and often pondered my source of Vitamin B12. Soya beans as in miso and tamari? Upon receiving literature from **The Good Gardeners' Association**, I now know that seaweed contains vitamin B12, also more calcium than milk, more phosphorous than wheat germ, more iron than eggs, more potassium than almonds and more copper than eggs.

Need I say more? So to J. A. Lane (EG4) and others, **eat seaweed**, also deep sea kelp powder. For EG readers interested in herbal medicine and naturopathy, there is a correspondence course available from: Mr F. J. Steed, Nature's Health Centre, Bruxner Park, via Coffs Harbour.

Also, for budding beekeepers, a correspondence course is available from the College of External Studies, Goulburn Street, Darlinghurst, NSW, 2010. Hawkesbury and Gatton Agricultural Colleges hold one week intensive courses in all aspects of beekeeping. Mainly for the commercial apiarist though.

Get a hive and stay alive in '75, Alan Orchard, Coffs Harbour, NSW.

* **For information concerning The Good Gardeners' Association. Write to the Hon Secretary for Australia and New Zealand, Rev F. W. Lloyd, 73 High Street, Sheffield, Tasmania, 7306.**

Dear Keith and Irene,

I have been in Australia since 1964 — originally from California — and am very interested in organic gardening, natural health and all other topics related to natural living and independence from doctors ("medicine men"), hospitals, chemical fertilizers, poison sprays, supermarkets and machines!

We sometimes feel a bit hopeless and isolated over here ... hardly a soul is interested in these subjects around Geraldton or north. Around Perth and south, yes, but we do not live down there!

The movement is in its merest infancy here, but infants usually grow, so we continue to hope. I can't stress too much the vital importance of the "WHOLE pie" — instead of all the fragmentation we have at present, ie separate bandwagons for organic gardening, natural health (preventive approach to disease), yoga, exercise, soil improvement, pollution prevention etc. They all work and belong together, as a functioning whole. That's what this complex subject, ecology, is all about.

Best wishes. Noel (and Dienie) McFarland, Geraldton, WA.

NATIVE SNAILS

Dear Sir,

An article appearing in the latest edition of EARTH GARDEN (No 10), has caused concern to me and I think the problem should be cleared up quickly. The relevant article, by Heather Cogger, discusses the introduction of native snails into suburban gardens to eliminate the "common garden snail problem".

The native species referred to is found naturally around the NSW coastal area and in the case and the area stated, I think the information suggested may have some foundation, but in other States this is not so and the results may be severe. I will point out the dangers as follows:—

1. The Victorian carnivorous snails would not survive in a garden environment, their natural habitat being bush and rainforest.
2. Even if they did manage to survive, carnivores seldom eat and one carnivorous snail may eat two garden snails a week at the most.
3. The damage caused to the ever-dwindling bush and rainforest areas by people digging for these snails would be considerable.
4. Introducing snails into areas other than their natural habitat would cause the natural balance to be upset, and information such as that contained in the article would only encourage people to transport alien species into areas where untold damage could occur if the snails established themselves.
5. Few people would know a carnivore from a herbivore and the chances of introducing more herbivores into gardens and creating a larger problem are great.
6. The native snails would have a balanced population in the wild, which would be seriously affected if disrupted by people collecting them in the quantities suggested.

The points I have stated are just some of the effects which will arise and even the possible introduction of NSW natives into Victoria would result in our natives becoming the victims of yet another INTRODUCED PEST, as bad, if not worse than the original common garden snail from Europe.

Yours sincerely, Miss R. J. Plant, Department of Invetebrates, National Museum of Victoria.

Adventures in wine

BY JOHN J. ALDERSON

Good wines need good winemaking.

You can no more get sherry without a sherry yeast than you can get merino wool without a merino sheep. The same applies for all other types of wine as it does for all other types of sheep. You cannot take pot luck.

There are several hundred types of yeast ... one puts holes in cheese, and one gives babies thrush. Apart from that, there is a great number of bacteria which will send the "must" (fermenting liquid) rotten or putrid, to say nothing of the possibility of getting vinegar instead.

Fermenting equipment — fermenter with airlock at right.

The first thing is to get your yeast and make a yeast culture. Before you know what yeast to get it is best to study up the recipe you are going to use. Grape wine is the easiest, but until you become an experienced wine maker and drinker it is best to work to a recipe.

For the beginner I cannot recommend too highly **The Pan Book of Wine Making.** The author is a stickler for the correct method, and it is best to make a good wine to a good recipe before experimenting.

With my 12th wine I worked without a recipe for the simple reason that I had passionfruit, but no recipe for passionfruit wine. It turned out a little strong of taste — one passionfruit goes a long way — and thin of body. If I make this again, and it is a good wine to go with dessert, I would use six passionfruit and half a dozen bananas per gallon, the latter to give it body.

My 14th wine was canteloupe (rock melon) and the same applies. I used four pounds of canteloupes and half a dozen bananas per gallon. Both were fair wines. My 15th was a leaf wine, wholly experimental, using an Australian native shrub. It was my first wonderful wine.

The next was lillypilly and it was magnificent. For the record, my 25th was prickly pear — and a failure. I still don't know why, but not liking it I have not bothered experimenting further. Start with proven recipes first.

Having decided what recipe to use the first thing to do is to get the yeast and make a culture. This is done by sterilizing half a pint or so of fruit juice or syrup (bring to about 160 deg F) and putting it into a sterilized screw-top jar.

When cold add some yeast nutriment and the yeast. Despite hopeful directions on most yeasts that they will start vigorous fermentation in eight hours they often take up to a week.

Thereafter the yeast needs feeding with a little syrup or sterilized fruit juice occasionally. Always leave a little in the "starter" bottle and add sterilized fruit juice again, unless you don't intend to make any further wine. The yeasts will live indefinitely.

The most commonly used yeast is **general purpose,** which gives about 15 per cent alcohol and is usually used for leaf and flower wines and the majority of fruit wines. **Tokay** yeast is used mainly for vegetables or things like carob beans, which will have a strong, heavy type of taste.

Sherry yeast is used for apples, plums, wheat etc, that is, for thing with a rather neutral taste. Tokay and sherry yeasts give an alcohol content of from 18 to 22 per cent. **Champagne** yeast is used for bubbly wines such as pear, apple, rhubarb and so on. Its strength would be about 14 per cent.

In general most wines can be started in a plastic bucket, preferably one with a lid. Otherwise it must be carefully covered. In wines where there is only juice, such as celery, this must go straight into fermenting bottles or plastic fermenters. With larger quantities — five to six gallons — a plastic rubbish bin is ideal, followed by a five gallon fermenter.

With the beginning of fermentation the "cap" rises to the surface and this should be stirred in once or twice each day. After from three to six days, depending on the recipe, the must is strained through a calico cloth into another bucket, everything having been sterilized with boiling water.

If your hands cannot stand water hot enough to kill wild yeasts then wash in a solution of "Sulgram" or some other wine sterilent (Campden tablets crushed). All of these release sulphur dioxide, which reputedly kills wild yeasts, but not cultivated ones ... notice my scepticism.

Some people do not like using sulphur dioxide as a sterilent, but I believe it to be safe.

The strained and fermenting liquid is now put into fermentation jars, which are gallon jars (five litre jars are now being made). A cork with an airlock is then placed in this (unless it is sherry, when a wad of cotton wool is stuffed in the neck of the bottle, as sherry needs air for its fermentation).

The airlock prevents the entry of wild yeasts, bacteria and vinegar fly — a fearful enemy to the wine maker. The solid matter strained out can be put on the compost heap or given to the pigs. I once had a possum who nightly investigated my compost heap.

Fermentation should continue until either the sugar is all converted to alcohol or the critical level of alcohol has been reached and the yeast stops working. The must should be tasted at every stage. Don't worry, it's pretty vile, and you should spit it out. At this stage further syrup may have to be added if the wine is too dry. Lactose is sometimes used instead, particularly for sweet, bubbly wines as it will not ferment.

A wine should always be tailored to your own taste. It is advisable to use a hydrometer all through to keep track of the sugar level. When fermentation ceases the yeast will settle and the wine will gradually clear. After about a week most of the yeast will have settled out and the wine should be syphoned or poured off. Don't worry much if you get some yeast. Of course a sterilized gallon jar should be used. Most recipes make up a gallon of finished wine, so there will be a small bottle over. It is important to have very little air space or the wine will spoil.

You now have wine. It should be left a day or so with the screw top not too tight in case fermentation starts again, in which case put back the airlock and be patient. If there is no sign of further fermentation, screw the top down and put the bottle away in a cool, dark place. Never at any stage allow the must or wine to be in the sun, and if the fruit is heavily coloured it should be shielded from the light all the time or there will be a severe loss of colour.

After about six weeks the wine should be **racked.** This is the removal of the clear liquid from the sediment at the bottom. This may have to be done a number of times (sherries a great number of times). When the wine is perfectly clear,, and not before, it may be bottled. It may be fit to drink at this stage, or it may need further maturing.

In general coloured wines should be matured. All sherries must be, and all ports. Some wines, such as apple, should be drunk quickly, because they do not keep and because they lose their freshness. The same applies to some white grape wines. Indeed the secret of a crisp white wine is to remove the skins etc from the juice as soon as possible.

Maturing is important. Wines will not mature in less than gallon lots (bottle maturing of course is effective afterwards). They should be kept cool, certainly not in a refrigerator, and of course in a reasonably dark place, free from vibration.

When the wine has cleared completely and is rough or undrinkable, or not what you dreamed it was to be, put it away to mature. It may take a few months, or it may take many years. But don't pour it out unless you know it is bad and why it is bad.

A poor wine has its uses ... in cooking. Two of the best cooking wines I've made were tomato (to a recipe) for which I wasn't keen and capsicum (to the same recipe). Both are excellent for cooking steak and pork chops. One puts the meat in a frying pan with a half a teaspoon of butter. Pour in the wine until nearly level with the top of the meat, salt and pepper liberally, put a lid on the pan and cook slowly until there is very little wine left.

Take off the lid and turn the meat over and cook until dry and browning. Pour a little boiling water and turn the meat again. Remove the meat just as the last of the juice evaporates. (Naturally use stewing steak).

It is important throughout to keep the wine labelled, particularly if doing more than one batch. Keep full records of what you do, and what it tastes like, and the hydrometer readings etc. It helps you trace troubles and helps you try to repeat the wine next year.

Every wine is an adventure. I have yet to make two that taste the same.

Label the wine when it is bottled.

One should build up a cellar, making wines that may be drunk soon, and those that must mature. Also make wines for various purposes. I have an excellent rosehip wine, rather on the tart side, which goes excellently with roast pork or duck, indeed any fatty meat. Mint wine will naturally go with lamb. A red grape wine added to fruit salad or strawberries makes them heavenly.

The easiest wines to make are flower and leaf wines. Almost all of these use a general purpose yeast. Normally use two quarts of flowers, three pounds of sugar, one gallon of water, eight ounces of chopped raisins or sultanas and the rind and juice of one lemon, one orange and one grapefruit.

Frankly I hardly ever use the grapefruit as they are pretty scarce. You may use two lemons instead. The flowers are gathered on a sunny day when fully open. Remove all the green calices. Pour four pints of boiling water on the flowers and fruit rinds and cover for four days, mashing the flowers down twice daily.

Meanwhile pour the other four pints of boiling water over the raisins or sultanas and when cool add the fruit juice, the yeast and some yeast nutriment. At the end of four days strain the juice off the flowers and add it to the raisins etc. After another three days, press and strain into fermenting bottles. Ferment to a sweet wine and mature. These usually mature quickly.

Flowers suitable include carnations, geranium leaf (Pelargonium quercifolium), primrose, roses, marigold (African), oak leaves (young) and walnut leaf (one large handful). This is a strongly aromatic wine and quite striking. Rosemary and lavender are also suitable.

I have made lucerne wine. Indeed it comes to mind because I have been drinking it while writing this article. Mint (also good for cooking steak) is made by the same recipe. Most herbs and spices will make wines, and I have about 20 or so maturing now, but I cannot comment except to say that cinnamon shows considerable promise (I used only two teaspoons of cinnamon, it's pretty strong).

Naturally a determined experimenter like myself does not always have success. Suffice to say that when I tried a eucalyptus wine I made a perfectly good wine which is undrinkable. The idea was to take it for a cold, but somehow every time I have a cold, I think my constitution is sufficiently enfeebled without adding eucalyptus wine. However, I must put it into little round three-cornered bottles and use it as liniment for sprains and bruises.

Happy brewing and happy drinking.

Water Wheels

Water-power can be obtained from any stream which flows swiftly or from a height. The ideal site for a water mill is at the point of steepest fall and the narrowest part of the stream.

After the sail, which first harnessed wind, water was the earliest non-muscular power used by man.

Yet it fulfils most of the criteria required by today's alternative technology. Water power does not pollute. There is no fuel to buy or transport. After the first cost there is little upkeep apart from grease and oil. Power is therefore virtually free.

An advantage of water is that its flow is fairly regular and predictable, though it may freeze in winter and slow to a trickle at high summer.

Where the flow of a stream is slow, the speed of the water can be increased by building a dam or weir, or by running the water off through a pipe or wooden trough to the wheel or water turbine.

The first simple water wheel, called the Norse mill, was used for milling grain. It had a vertical shaft with horizontal paddles fanning out from the centre. A fixed millstone moved around with each revolution of the shaft.

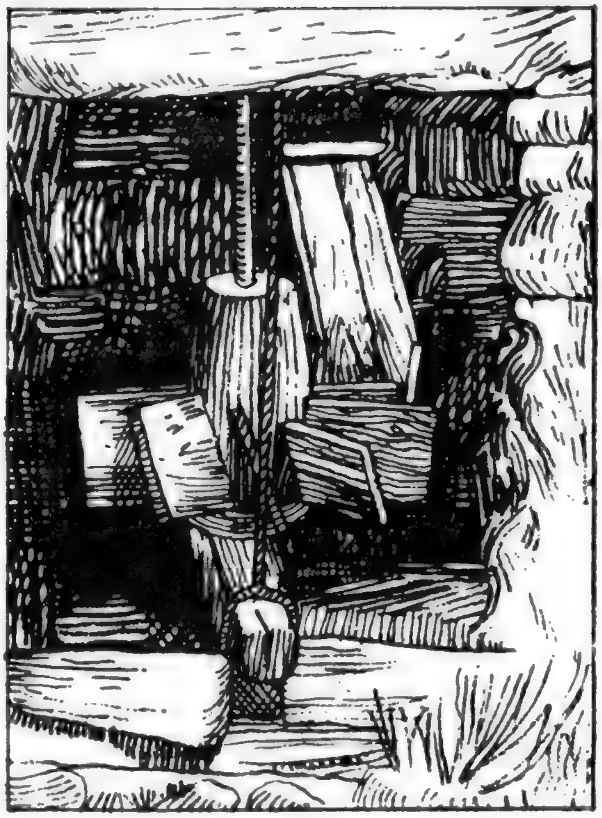
Such a mill was usually built on the edge of a swift stream, so that some of its paddles extended into the current.

The next development, recorded by the Roman historian Vitruvius, was the water wheel of the Norse mill turned on edge and mounted on a horizontal axis. It was an **undershot** wheel, turning as water flowing underneath struck the low paddles.

Gearing made this water mill far more efficient, as Vitruvius describes it:

> **... at one end of the axle a toothed drum is fixed. This is placed vertically on its edge and turns with the water wheel. Adjoining this larger wheel there is a second toothed wheel which is placed horizontally by which it is gripped. Thus the teeth of the drum which is on the axle, by driving the teeth of the horizontal drum, cause the grindstones to revolve.**

Water mills are generally supposed to have been invented in the Egyptian-Mesopotamian "fertile crescent" about 2000 years ago. The illustration from the 14th Century Luttrell Psalter shows an **overshot** wheel, with eel traps at the right which gave the miller an extra income.

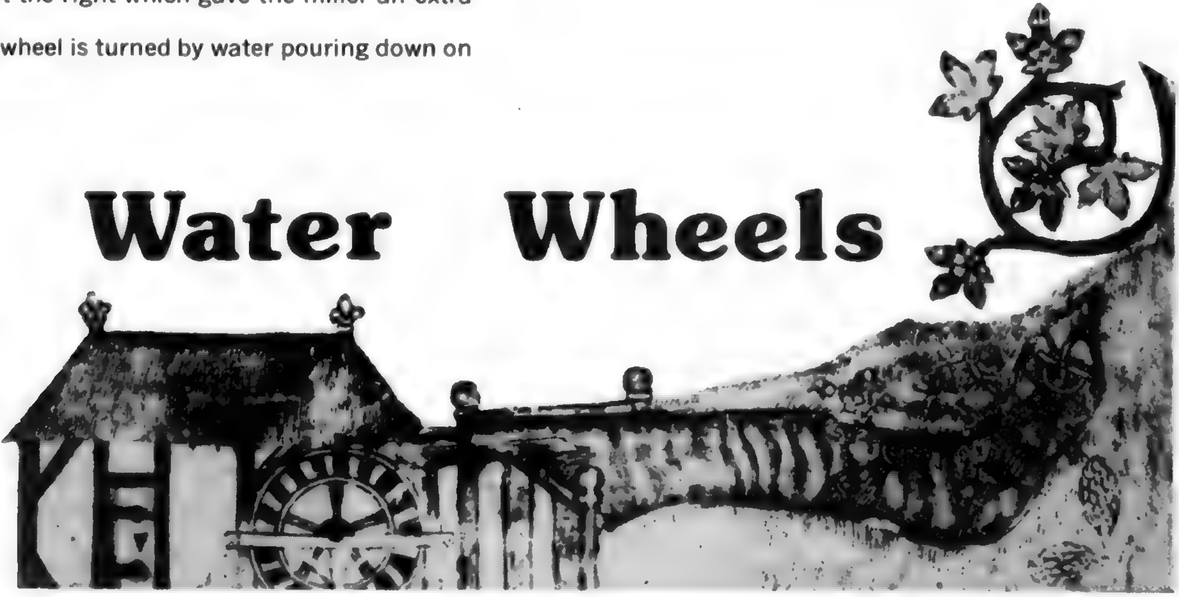


The Norse mill.

The overshot wheel is turned by water pouring down on the upper paddles from a sluice or mill race over the top of the wheel.

An early written reference to the water wheel was made in a poem by Antipater of Thessalonica about 85 BC —

> **Cease your work, ye who laboured at the mills. Sleep now, and let the birds sing to the blood-red dawn. Ceres has commanded the water nymphs to perform your task, and these, obedient to her call, throw themselves at the wheel, force round the axle-tree and so the heavy mill.**



By the 4th Century, water power was being used in Roman Gaul to saw marble. In late Roman times, the city of Rome got its flour from a battery of water mills on the Ianiculum Hill, where the Vatican now stands.

In Medieval times, when more efficient gear positions, sizes and ratios had been worked out, water mills produced more power than several hundred animals. The Domesday Book, a survey made by William the Conqueror in 1086, did not list a single windmill, but records that there were then 5624 water mills in England.

The feudal landlord had a monopoly on grain milling and his tenants were forced to use his mill. Water wheels were developed to pump water, saw wood, spin silk, make paper, pump bellows, run blast furnaces and for polishing and boring.

A sketch by Villard de Honnecourt shows the workings of a water-powered sawmill, found in his notebook of about 1230. The Pont aux Meuniers, a bridge over the Seine at Paris lined with water mills, was carried away by the river in 1596.

Ship mills, looking rather like paddle-wheel boats, were moored in a river. They were undershot, turning as the river current flowed past.

After Richard Arkwright's invention of the water-frame — a water wheel-powered mill for spinning cotton, water power was used to run machinery along North Country watercourses. Then came the steam engine, a different kind of water power, which was to usher in the machine age as we know it.

In the **breast** wheel, used in the early 19th century textile mills, water meets the wheel at a point level with its axis, then travels vertically down and out under the wheel. So it revolves in the opposite direction to the overshot wheel.

The type of water wheel or turbine chosen depends very much on the site, on the speed of water flow and the amount of **head.** The term head is used to describe the vertical distance the water falls to the **tailwater,** the surface where the wheel will be placed.

An undershot wheel needs the smallest head — six feet or less, but it is the least efficient of the three types.

The overshot wheel needs a head of from 10 to 30 feet. Water is fed through a wooden or metal trough and a gate at the end of the flume controls the flow to the wheel.

The breast wheel needs a head of five to 15 feet, but involves extra work building the curved "breastwork", a rounded framework which is fitted close to the wheel to reduce friction and keep water on the wheel.

Water wheels require gearing and belting and are mostly used today for generating electricity, but may be adapted to pumping water, flour milling, sawing wood or running a lathe. The best description of hitching up a wooden overshot wheel to a car rear end and generator is in **Cloudburst** (see further sources).

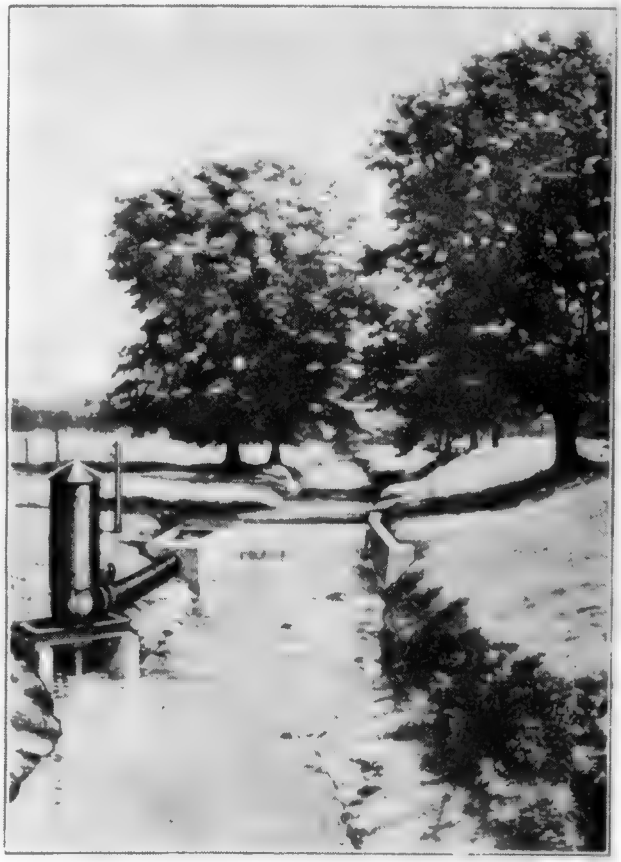
The Pelton wheel, patented by Lester Allen Pelton in the United States in 1880 is an **impulse** wheel, turned by an angled jet of water as it hits cups or buckets attached to the wheel. It is used for high heads and small volume of water and has an efficiency of about 90 per cent.

Water turbines provide electricity in remote areas and can be installed at the side of a river with little interference to the main flow.

The Hoppes Hydro-Electric turbine, made by James Leffel & Co is a small unit which needs a head of eight feet. It delivers direct current power and may be coupled to run a pump or machinery by electricity.

So far we have been unable to track down any makers of water wheels or water turbines in Australia. If you are aware of any, let us know.

The best method seems to be "do-it-yourself". Agricultural equipment is useful — Jeff Williams used a binder wheel to make the water-powered pump described in EG3 and Tony Wedd used a buckrake wheel as the base for the undershot grain mill he writes about in this issue.



Leffel's Hoppes Hydro-electric unit

PRIMARY SOURCES

Your Own Water-Power Plant, Dams Turn Water Into Kilowatts, Water Wheel Delivers Over 3 HP and Building an Overshot Wheel, C. D. Bassett, Popular Science Monthly (US), series of five articles, April-August, 1947.

This has been reprinted in **The Mother Earth News Handbook of Handmade Power** and **Cloudburst,** which may be easy for you to obtain. Otherwise you should be able to look up the original articles in State libraries. They make a good introduction to water wheels, measuring stream flow and making dams and include plans for a Pelton and an overshot wheel.

Hints on the Development of Small Water Power (Pamphlet "A"), Hydro-Electric Power from a Hoppes Hydro-Electric Unit (Bulletin H-49), The James Leffel & Co, Springfield, Ohio 45501, USA.

These leaflets, available on request (send an international reply coupon), explain how to measure the flow of water required for a water-powered electric turbine, with a description of the company's vertical Samson turbine, available in sizes from three to 29 horsepower. The Hoppes unit comes in sizes of one to 10 kilowatts and the bulletin tells you what data you need to submit before ordering. Leffel has been in business for 111 years!

Low Cost Development of Small Water Power Sites, 1967, 43 pp. Price $US1.00 from Volunteers in Technical Assistance (VITA), 3706 Rhode Island Avenue, Mt Ranier, Md 20822, USA.

VITA's booklet is probably the best for beginners with water power (and aren't we all?). It details flow measurement, building water channels and earth dams and explains the workings of various water wheels and turbines, including the Mitchell (or Banki) turbine.

It has recently appeared as a chapter in **Producing Your Own Power** while the Mitchell turbine section is reproduced also in **Cloudburst.**

VITA is a group of scientists, engineers, educators and others who volunteer their skills to help developing countries with technical problems. Other manuals available.

Village Technology Handbook, 1970 (revised), 400 pp, $US7.00. Solar, wind and water power — also available in Spanish.

Hydraulic Ram for Village Use, 1970, 9 pp (also in Producing Your Own Power), $US0.25.

Low Cost Windmill for Developing Nations, 1970, 45 pp, $US1.00. Prices include surface mail. Ask for a publication list.

Water Running Wild, Small-Scale Water Power, George Woolston, Undercurrents No 6, March/April, 1974, Stg 35p, from: 275 Finchley Road, London, NW3, England.

Water Power, Alternative Sources of Energy, No 14, May, 1974, and Water Power, section IV of ASE's Bibliography Issue, No 9, February, 1973, each $US0.75, from : Rt 2, Box 90A, Milaca, Mn 56353, USA.

The Bibliography issue also lists energy and power, solar energy, wind, energy storage and conversion and agriculture and organic fuels.

OTHER SOURCES

Cloudburst, A Handbook of Rural Skills & Technology, ed Vic Marks, Cloudburst Press, Brackendale, BC Canada, 1974, 126 pp. Price: $A4.25.

Cloudburst has been around for a while and will be familiar to many people because of the fanciful cover illustration of domes and gardens by Cindy Green. First printed in 1973, it's now into the fourth edition — and it deserves to be.

To stay with water power for a while — Cloudburst has original articles on building a wooden undershot wheel and a wooden overshot wheel, written by Glen Bass and Don Gilmour, who explain in detail just what they did. Both wheels operate electric generators and are clearly illustrated.

As well as the reprints mentioned earlier, there's another original piece on Water Wheel Design by Guy Immega. Other contents include: A 16ft personal dome (really complete instructions), finished with cedar shingles, splitting shakes, pit privies, storing fruit and vegetables, a homemade windmill, gravity feed water supply, poultry housing, a sauna, juice press, smoking fish, building beehives and cheese making.

Quote: "Cloudburst is a book of people's experiences; people who are finding ways of living harmoniously with nature rather than exploiting it; people who are seeking to think small in a world overrun by big thinking; people who are forming lifestyles based on the economics of self-sufficiency."

A second issue is expected shortly with more knowledge to help those "living and working on the land".

Our review copy from: Third World Books, 20A Goulburn Street, Sydney, NSW, 2000. Postage and packing would be about 50 cents.

The Mother Earth News Handbook of Homemade Power, Staff of TMEN, Bantam Books Inc, New York, 1974, 374 pp. Price $A1.95.

Besides the reprints from C. D. Bassett's Popular Science articles this useful paperback has stories on hydraulic rams and a further water wheel electric generator.

The rest is mainly information from past issues of The Mother Earth News, bar one from Alternative Sources of Energy. Solar and wind power are well covered, methane not so practically, but there's enough to whet your appetite and the excellent bibliography is a bonus. A good energy primer.

Our review copy from Compendium Pty Ltd, Centreway, 259 Collins Street, Melbourne, Victoria, 3000. Postage about 30 cents. For 50 cents extra Compendium will send their catalogue of self-sufficiency titles available by mail order.

Producing Your Own Power (How to Make Nature's Energy Sources Work for You), ed Carol Stoner, Rodale Press Inc, Emmaus, Pennsylvania, 1974, 322 pp. $A8.95.

This is the first book on alternative energy which we read — and we were duly impressed. The water section, however, is entirely composed of two VITA booklets listed earlier and it shares wind power authors in common with The Mother Earth News. To complete the cross-pollination, technical consultants were Eugene and Sandra Fulton Eccli, co-editors of Alternative Sources of Energy magazine.

If an evaluation must be made, you could say this book is stronger than the Mother's handbook on methane (more practical), wood power (Ken Kern is hard to beat) and wind (same authors, but better stuff). The solar water heater plans are to be preferred also.

Well, it's a Rodale Press book and high standards are expected. To balance up, this is a hardback and considerably more expensive than the paperback. The clincher here is the chapter Combining Alternative Energy Systems by the ASE people. You probably need both for an overall picture of practical alternative technology, about which we write at more length elsewhere.

Available direct from the Australian distributor, Publishers. Distributors Pty Ltd, 97 Ryedale Road, West Ryde, NSW, 2114. Postage and packing about $1.00.

Science and Civilization in China, Prof Joseph Needham, Cambridge University Press, 1971, 4 vols, thousands of pages. Expensive — $15 to $32 per volume. Try the library.

Professor Needham's scholarly work is the accepted source on both ancient and modern Chinese thought and action. Vol 4, Part 2, covers water power and the noria. It's all there — water clocks, sailing wheelbarrows, pise building, irrigation, Taoism, astronomy. Everything you wanted to know about China and then some. Unique graphics.

the noria

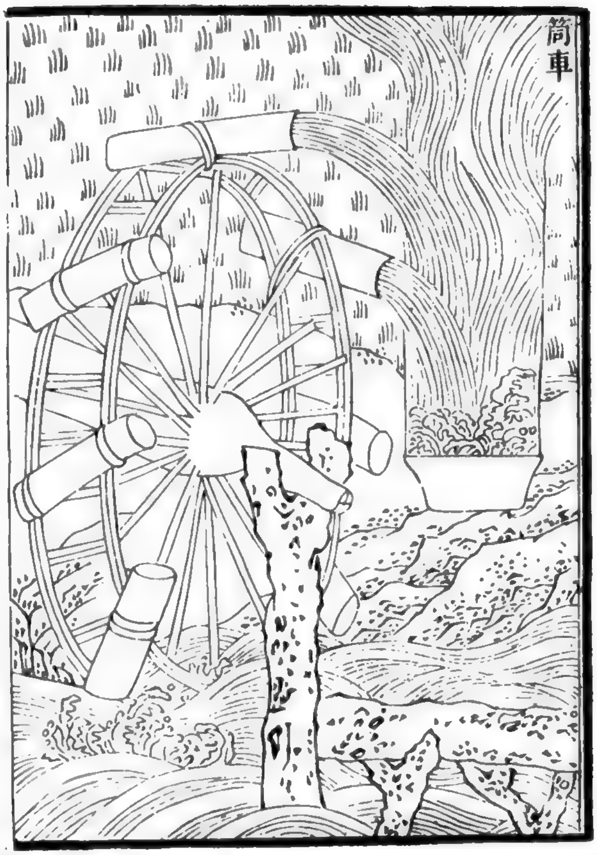
The noria, or peripheral pot wheel, raises water and is itself driven by water. It combines an undershot wheel with a water hoisting wheel.

The first mention of such a device was made by Philon of Byzantium in The Elements of Mechanics about 200 BC. However, it is thought that the chain of buckets and water wheel he described was meant as a mechanical toy, like many water-powered contrivances he designed.

The name noria is derived from the Arabic na'ural. The water buckets or tubes at the edge of the wheel are sealed at one end to hold water. They fill while passing through the water, remain upright when rising and are inverted when the wheel descends. As the wheel turns water is poured out at the highest level into a channel or conduit.

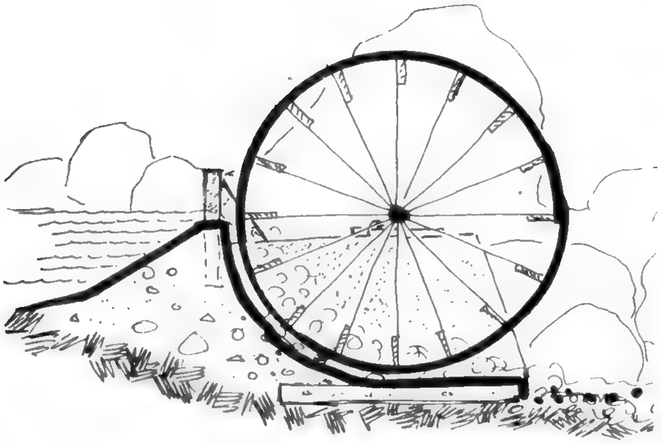
The noria, usually made of wood or bamboo, has a high lifting capacity. A more primitive water pot wheel called the saqiyah was driven by man or animal power.

The Chinese drawing of 1628 shows a noria delivering water to a channel drawn to plan. The more recent photograph (1943) of a group of three norias at work near Chhengtu in Szechuan does more justice to the high lift available. Both illustrations are from Science and Civilization in China.



A Miller's Tale

BY TONY WEDD



SECTION through mounting

It is raining on Mt Worendo.
The Albert flows in spate.
And merrily, merrily goes the wheel
Morning, noon and late.
Peter has ploughed up a meadow
To harvest a golden fleece
Beside a prattling river
Where the rainfall does not cease.
So merrily, merrily goes the wheel
Scattering gems again,
That is painting the valley golden
With Mt Worendo's rain.

About a year ago we bought our own mill.

This was a little, hand-operated "Corona", as mentioned in EG5. It looks rather like a meat-mincer.

At last we were able to bake with freshly-milled flour, which conserves the wheat germ and the vitamins. Nutritionists insist that you should bake within 24 hours of milling, as oxidising destroys the goodness of whole meal flour. (White flour hasn't any goodness, anyway!)

We noticed a great improvement in the flavour of our bread.

We found hand milling was rather a grind. I used to read a book as I cranked away. It took me over half-an-hour to do the flour for baking three loaves and a dozen rolls. We used to talk enthusiastically about building a water wheel to do the job for us.

Then, miraculously, the Youth Hostel Association sold us the hostel. It was mid-winter, and the Albert was running low.

We went to work, knowing that we were here now for keeps, to run the place as we wished.

When the 1975 handbook came out we were among the "associate" hostels, offering our visitors all the facilities for baking their own bread here. (Bring your own additives!)

The river here is a series of little cascades among the rocks, and we did not want a major engineering project which intruded on the rustic scene of bullocks grazing against a backdrop of mountains. An undershot wheel, using a head of two-to-three feet seemed to us to be the best choice.

There was one spot where an island was separated from the nearer bank by a little channel of about six feet across, and we cleared this of boulders and hollowed out a tail-race of about 30 yards, working back to a spot beside one very large boulder which completely hides the wheel from across the river. Here we stopped off the flow with a temporary mud dam, as we built the mounting for the wheel.

Almost every farm in the valley seems to have its derelict buckrake: I have counted six within sight of the road.

The wheels are 4ft 6in in diameter, and made of iron. I ground down the ends of an inch pipe to make an axle that set them just three feet apart.

Someone found a brass bearing that fitted one end nicely, where the drive comes off. The other just sits loosely on a notch in a bit of three-by-two. My first idea was to have the wheel free to lift off the mounting in case of a flood, of which we get a few every year, especially in the late summer.

Then we precast nine or ten slabs of our special garden pavement: cobble stones set in a sprinkling of sand with a mould around them to give a slab about 3½ inches thick. Cement is poured on top of the cobbles, a bit of chicken wire placed in for reinforcement, and the rest filled up with old paving, broken stones, bits of asbestos-cement and so on. It has a natural effect, even though the surface is fairly flat.

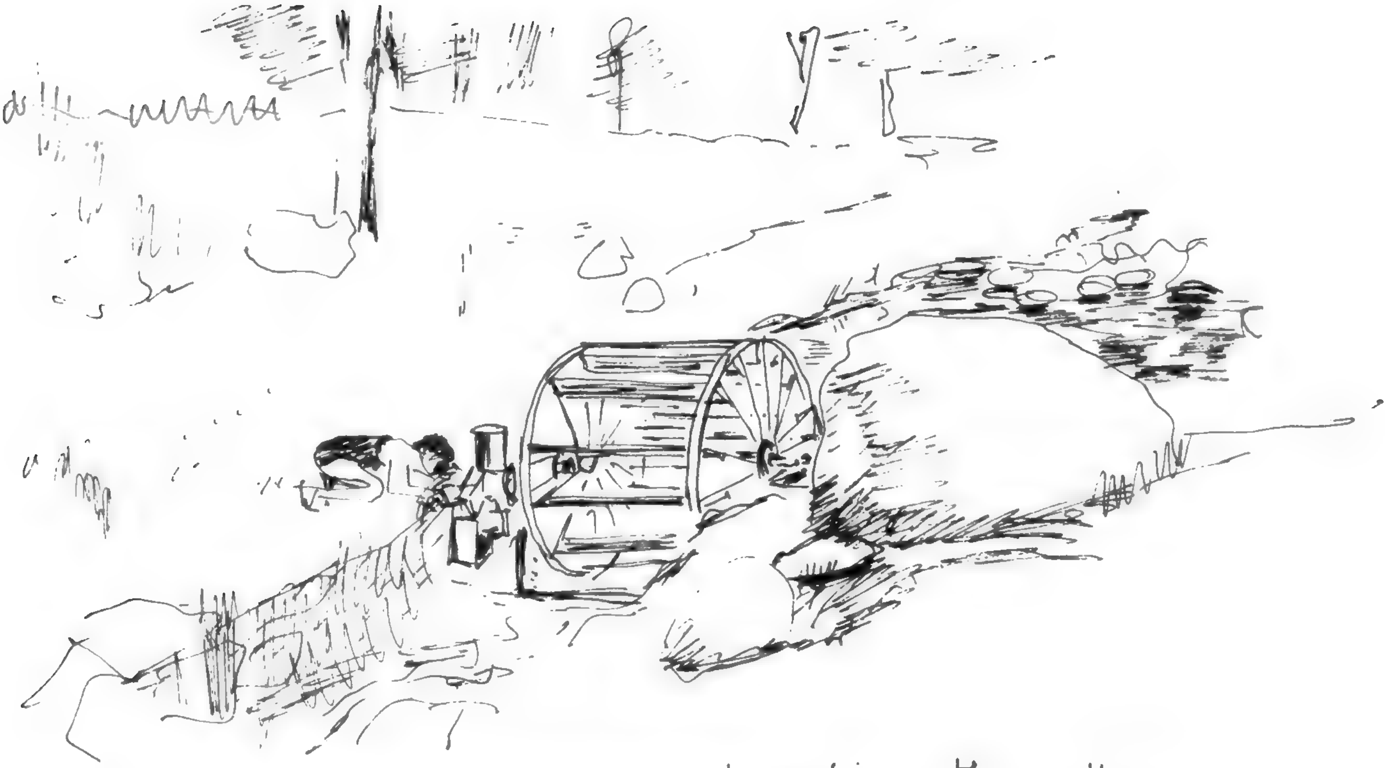
There are two slabs on the bottom surface, giving a level base for four more slabs on either side. All of these were packed in and carefully cemented together, with more cement and rubble to close up the space against the bank on one side, and the boulder on the other. Three more made up the weir, with a six-inch drop to spill the water, and another two buttressed the sides from on top of the mounting for the wheel.

Then I set up the buckrake wheels and the axle on their bearings, and used a single board attached to the spokes to give me a template to construct the curve from the weir to the cobble stone base. When this was satisfactory I put the paddles on the wheels, yard-long lengths of 4 feet boards. These were wired on to the spokes, with a second wire around the rim.

The arrangement can work loose after a long run, so we keep the wheel still when not grinding. Barely a weekend passes, however, without some young monkey setting it going again . . . what fun to play with a water wheel!

When the time came to construct the dam, cement became unobtainable. It is a nasty product, very polluting, so there is an argument for using clay anyway. A bit prone to washing out. Cynics say that the time we save on hand grinding is spent on paddling round in the millpond plugging up leaks in the dam with fresh gobs of clay. It is a lie!

The handle of the Corona comes off very easily, and the shaft exactly fits a v-belt pulley with a ¾-inch bore. I cut

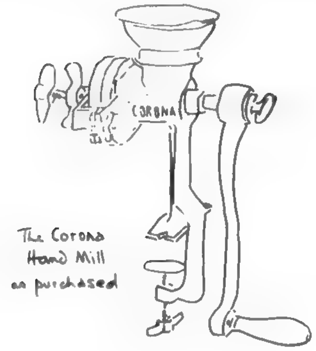


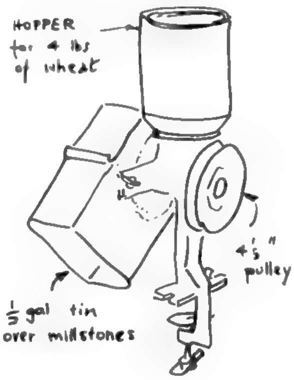
Inspecting the flour

down a short length of ¾-inch rod for the other pulley, threaded it with a half-inch pipe thread, and matched it to the end of the axle with an ordinary pipe reducer.

One reason for selling us the hostel is the landslip that threatens to engulf us. We dig away barrowloads of clay all the year long. Carting these down to the creek to build up a dam was a long haul of about 200 yards, but very satisfying.

We joined up two grassy islands, and hope the same grass will eventually grow along the dam of boulders and clay that we made. The resulting pond makes a safe swimming hole for my daughter Elyssa aged four. Indeed, we hardly get down to the water wheel, preparatory to setting up the mill, but her clothes are off and in she pops.





Adapting the Mill

We had to give ourselves a bigger hopper, capable of taking four pounds of wheat, and to house the works in a sheathing that would keep out the water. When the river is flowing fast, the wheel certainly spins merrily, and scatters drops of water freely.

A half-gallon tin shrouds the grinding stones, and supports the gallon tin that collects the flour. We tape a piece of plastic round to give an apron that covers the gap between them. A 2½lb powered milk tin is fixed over the rather small hopper, giving us a lid to keep the wheat dry, and plastic puttied to complete the seal.

The usual clamp serves very well, as we remove the mill at weekends and when there looks like a storm coming. Setting up the mill is just a matter of screwing up the clamp and fitting the pulley belt. There is a piece of two-by-one on the mounting which gives us a place to attach the mill. Then a bit of folded galvanised iron makes a rain cover, a bit primitive, but we didn't expect our first attempt would be our last.

We abandoned the idea of lifting out the wheel: it would need a jib or a gantry, and the thing would be too obtrusive. Our idea now is to have detachable paddles, which we could remove if a flood was imminent, and replace when it has gone, but the details have yet to be worked out. Possibly they could be tied to the rim with nylon cord.

Mechanically, however, the thing works excellently. It does about 1-2lb of flour in an hour, which is slow and the better for that: a cooler grind.

Our hostellers are busy inventing new recipes, some knead, some don't. And we grind for our farmer friends. The immediate consequence is that Peter, the Keyline enthusiast here (see EG2) is going to plant eight acres in the autumn.

At the moment we are getting compost-grown wheat from Dalby. God knows what goes into the usual stuff, but certainly some malathion to keep down the weevils.

Our formula is to store the wheat with sprigs of tagetes — stinking roger — but we have yet to prove its efficacy.

The Grant Loaf

I took to baking my own bread 25 years ago, when felling timber for my living. White bread did not give enough stamina.

In England it was possible to get whole meal flour from most health food shops, and Allisons and Prewetts both offered organic cereals, and a recipe of Doris Grant's for baking it.

The principle of the Grant loaf is to avoid kneading, and so the time wasted. You can have a Grant loaf within the hour, more or less.

Rolls, which are easier to eat hot, take only 20 minutes from putting in the oven.

I believe the idea of the kneading was to have a stiff dough that would stand up in the oven. The "cottage loaf" indeed, consisted of two balls of dough, sitting one upon the other. Obviously, where you burn whole faggots in an oven, you haven't room for shelves.

They just raked out the ashes and popped in the cottage loaves.

Doris Grant uses bread tins, and kneading has ceased to be important. Indeed, I think the kneaded bread goes stale the sooner, because of oxygen incorporated into it.

The Grant Loaf is made from 3lb of wholemeal flour, 2oz of salt, preferably table sea-salt, 2-3 teaspoons full of sugar, 1oz yeast and 1¾ pints of luke-warm water (blood heat).

Mix the sugar in a cupful of the warm water and add the yeast. Put in a warm place to froth up for 20 minutes to half an hour, and add the rest of the warm water. Then mix the salt into the flour in a mixing bowl, and add the frothy yeast and water.

Mix thoroughly by hand until evenly wetted, enough to be slippery and leave the mixing bowl clean.

Then prepare three two-pint baking tins by warming them and greasing them with a good vegetable oil like maize oil, or dripping. Divide the dough between them, half filling the tins, and set aside in a warm place, under a cloth, to rise to within half an inch of the top of the tin.

Then bake in a hot oven at around 400 deg F for about ¾ hour to 1 hour. Turn out on to a wire mesh to cool. It will keep for five days or so, and still be good for making toast.

We vary this recipe by cooking a dozen rolls, and we use honey instead of sugar. The rolls go into the top of the oven on our old wood stove, the loaves into the bottom to rise: the rolls, being small, rise as much as they need to in the time it takes to warm them up, and when they come out, the loaves go into the top space of the oven.

You could probably make three bread tins out of a honey tin with the top and bottom cut off, and rolled into a flat sheet by cutting along the seam, but I have yet to try it.

We walked into a bakery and conned three tins out of the System. As I say, it is better to tap the System than to knock it.

preheater

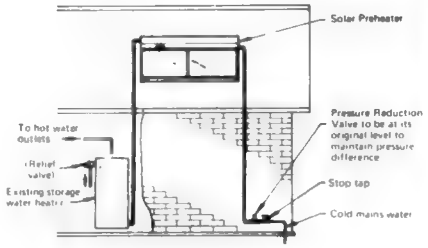
The Beasley solar water "PREHEATER" should have appeal to everyone. The unit, which costs about $200, delivers sun-heated water directly to your existing fossil-fueled storage hot water system, with consequent savings in power costs.

A 1.7 square metre collector with copper piping is coupled to a 28.5 litre (6¼ gallons) insulated copper storage tank. The unit is roof-mounted.

During sunny daylight hours water is circulated continuously through the preheater, getting hotter and hotter. When you turn on the kitchen or bathroom tap, hot water enters your electric, gas, oil or solid fuel water cylinder.

Up to 114 litres (25 gallons) of water circulates through the preheater in a day (about four complete changes of the tank are possible). This provides a large part of the estimated 160 litres (35 gallons) of hot water which the average Australian family (rather wastefully) consumes daily.

The preheater works with either constant water pressure, gravity feed ceiling units, gravity feed floor units or normal mains pressure up to 700 kilo Pascals (100 pounds per square inch). We checked with Sydney's Metropolitan Water & Sewerage Board and found that mains water pressure in the city and suburbs has a guaranteed minimum of 149 kPa (21.7 psi) and in some places exceeds 700kPa.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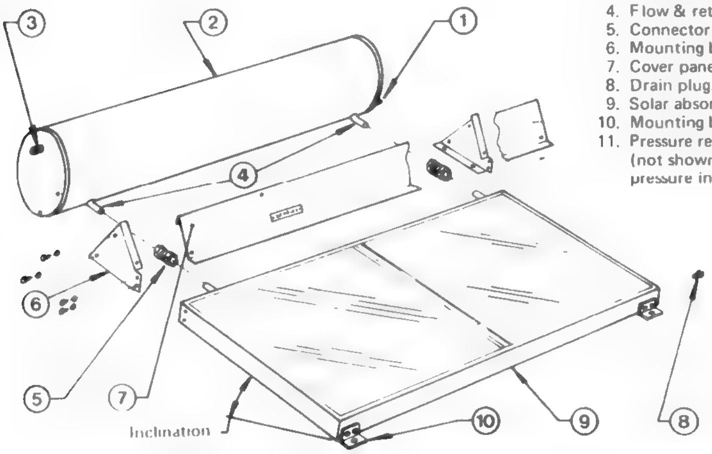
However, Beasley has an answer for this — a simply-installed pressure limiting valve. The Preheater does not disturb the position of your present water heating system. Once in, no maintenance is needed.

The company estimates a saving of about 50 per cent on annual water heating costs in Sydney, Adelaide, Cairns, Canberra, Brisbane and Mildura, 45 per cent in Melbourne, 65 per cent in Alice Springs, 60 per cent in Darwin and 55 per cent in Perth.

For further information send a 10 cent stamp to: Beasley Industries Pty Ltd, Bolton Avenue, Devon Park, South Australia, 5008.

PARTS

1. Cold water inlet (¾ BSP).
2. Storage cylinder.
3. Hot water outlet (¾ BSP).
4. Flow & return connections
5. Connector assembly (2 per)
6. Mounting brackets (2 per).
7. Cover panel.
8. Drain plug.
9. Solar absorber.
10. Mounting brackets (2 per).
11. Pressure relief valve. (not shown)—for mains pressure installations only.



more letters

Dear Friends,

With encouragement from Link-Up and Learning Exchange I have started a register of all groups interested in the alternative lifestyle field, with the aim of providing a central reference point for all those seeking to make contact with Co-ops and communes.

All I need to know is the broad aims of the group, any special membership requirements, costs, and a rough outline of plans. I am sure you will understand how useful such a register as this could be.

Yours in Peace and Friendship, Lionel Pollard, 7 Duncan Avenue, Boronia, Victoria, 3155.

Dear friends,

We are in our 50s and we enjoy the magazines more than any others we have bought. Especially good was the freedom from the same advertisements in each issue.

We have a log cabin on a 40-acre block. It is the most comfortable home we've had.

A good, long "Doctor" flannel dressing gown is one luxury all girls should get before going bush. I'm on my second now — the first lasted for 15 years. It was always warm on frosty mornings and safe near open fires and wood stoves.

Do mention how dangerous flannelette and nylon gowns are when you get a chance. "Doctor" flannel is pure, lightweight wool, now machine-washable. It is expensive, but wears long after the cost is forgotten.

Sincerely, Clarice McCallum, Canberra City, ACT.

Dear Irene and Keith,

I have my 10 copies of EARTH GARDEN in a binder bought for $1 at a newsagent's sale. It is, rather appropriately, a binder for a magazine called Book of Life.

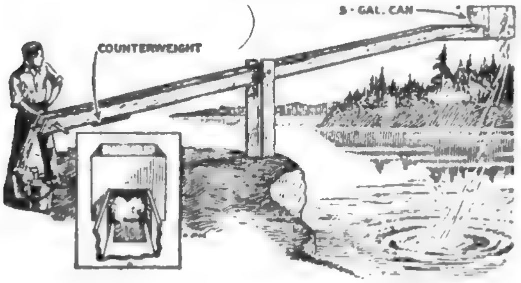
Melissa looks beautiful. I am a Triple Certificate nursing sister and have worked amongst Aboriginals in the Northern Territory for three years and also did village work in Papua New Guinea. I am a great advocate of breast feeding. Bottle feeding has killed more native babies than I care to think about.

Very best wishes, Val Langdon, Gundale, Queensland.

A NEW SHADUF

To draw water over a steep bank you can make use of a refinement of the shaduf. A five-gallon tin, with the top removed and a square hole cut in the side, is mounted on one end of a trough, which is pivoted between two upright timber pieces at the edge of the bank. A slight recess at the end makes filling up easier.

The "land" end of the trough has a handle and is counterweighted to balance the water tin.



Is sunlight 'organic'?

Tony Wedd.

Before you throw away that old wood stove, pause a moment and consider how much poorer your food will taste from then on. Only yesterday a visitor was telling me her grannie could "do things" with her old wood stove that were impossible with gas or electricity. The thermometer, evidently, does not tell all.

Heat is a vibration, like sound. And just as measuring the decibels in a passage of Beethoven's is no guide to the music, thermometers offer no guide to the quality of heat. For, as every chef knows, there are different sorts of heat.

At Zurich University, Professor Kunzli used the rate of growth of yeast cells as a more discriminating measure than a thermometer in a calorimeter of water. He found that the closer the fuel was to the living organism, the more beneficial it was to the living organism.

Hay, twigs, forest timber, charcoal, coal, gas, oil and electricity, in that order, tended to be detrimental to the growth of yeast, the last the most. So firing of those old brick-built beehive ovens you can still see in English cottages, was pretty wise after all: the faggots they used were nearly as good as the cow-dung used in India.

Charcoal is also high on the scale. How many chefs prefer this when they could have more sophisticated cookers?

I do not know where solar heat comes on Kunzli's scale.

If, as they say, sunlight is derived from nuclear reactions, it would probably come even lower than electricity. But as the energy which precedes photosynthesis, it might come the highest. The answer would be found in the baking, I dare say, so I look forward to tasting bread baked in concentrated sunlight, one fine day.

hard cheese

BY FRAN BICE

Here's a recipe for making hard yellow cheese which I learnt from some Italian neighbours and which seems a lot less complicated than the Ag Department leaflet and other recipes I've read. The cheeses I've made so far have been rather hard, but quite tasty and are ready after three months.

We were only milking one cow, so I saved the milk in the "frig" for a few days until I had enough.

For each gallon of milk use one junket tablet. Heat the milk and add the tablet as instructed on the packet. When the junket is set (say ½-hour), cut the curd up using a sharp instrument. Our friends suggested a broom handle spiked with nails — I used a bread knife.

Somehow you should avoid "bruising" the curd as this causes undue loss of cream in the whey. When the curd is diced up as finely as possible, put the whole lot back on the heat and raise to a temperature just bearable for your hand (like yoghurt temperature). The curd will tend to sink to the bottom, so keep stirring and breaking up the lumps until it is hot enough.

Remove from heat and allow to stand for say 15 minutes. Have ready a ½ gallon plastic ice-cream container, punched all over with holes. Now the curd should have sunk to the bottom and formed a big lump which you should just about be able to pick up all of a piece and squash into your container. Press down for a few minutes to make it smooth and expel most of the whey.

Then you can leave it for 24 hours to drain further. It is beneficial, but not absolutely necessary, at this stage to weigh it down with something really heavy to speed the expulsion of whey.

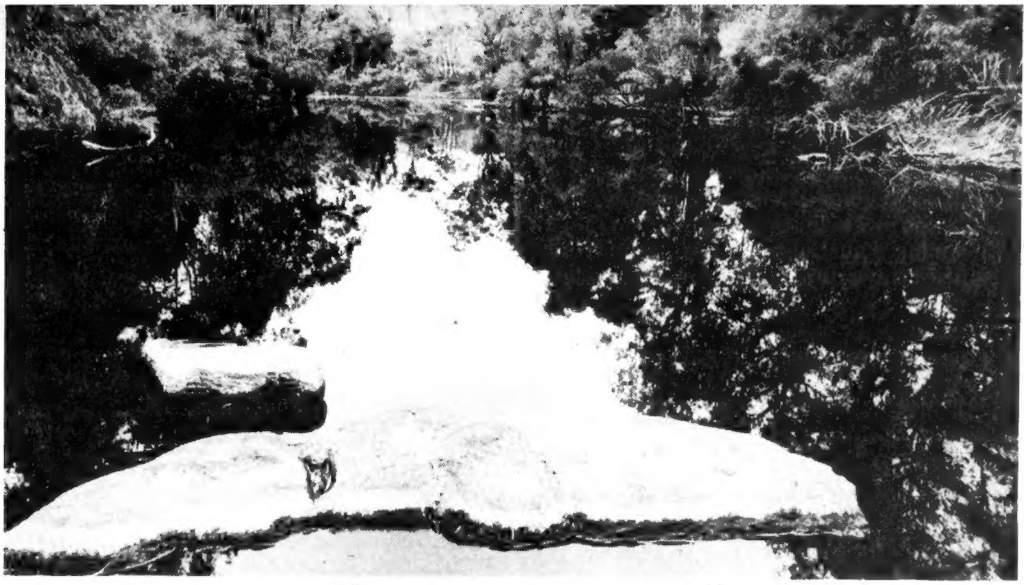
Next day, take it out of the container, turn over on to a folded cloth and rub a bit of salt over the top. Do this every day until each side is salted twice. It should be already turning yellow now.

To help form a skin or rind you can now wash the cheese in hot whey (hot water will do). When it dries off, you can rub the cheese all over with vinegar. If there are any cracks, rub a bit of butter into them. If there is mould — rub a bit of salt on it.

Leave the cheese in a cool, airy place until you're ready to eat it. A gauze safe is really handy for storing the cheese at all stages in the making. After the week or so it takes to make it, I hang my cheese up in cheese cloth to allow a free circulation of air. This seems to prevent mould forming.

I have about a dozen 2lb (2 gallon) and 3lb cheeses maturing at the moment. If anybody has any finer points I'd be happy to know as there are possibly some improvements and variations to be made. I was amazed how simple this method is — and how successful.

Previously we couldn't use all our milk, even making cottage cheese, butter and yoghurt as well. Now I think we'll buy another cow!



ataraxia

If you're thinking of visiting Western Australia, or you're just interested in our giant state (three times the size of Texas) — and this copy of EARTH GARDEN in your hand isn't six months old — then go west now, in time for the Ataraxia Festival.

The dates are April 20 to May 4, 1975. Admission for adults is $15 for ten days, or $2.00 a day. Kids under 12 are free. Tickets for ten days entitle you to three free Hangi feasts.

There will be music (Dollar Brand and other African musicians), drama (bring your own troupe!), art (exhibitions and arts co-op), poetry workshop, learning exchange, film, video faith healing, naturopathy, herbalists, yoga, meditation and "all the love in the land". Here's a report from the organisers; Tina and Bauxhau Stone:

After our involvement with the Aquarius Festival, Bauxhau and I stayed at Nimbin for another six months until November, when we suddenly found ourselves heading west to Perth for no apparent reason, and with such urgency that we left half our things behind.

For six weeks after our arrival our search for a house in the hills was fruitless, but our certainty that there was one "waiting for us" prodded a friend's memory of one in the Roleystone Hills, with the remark that it was "probably too secluded for us".

She drove us down a long, narrow bush track, into a wonderful valley — a weatherboard house stood before a large orchard, surrounded by hills of untouched gum-scrub. The water came from a natural spring at the bottom of the property of 95 acres, and the rent was $10 a week.

The place was too good not to share. Although we knew hardly more than six people in Perth we duplicated an invitation to a "Hangi" ... which is a Maori-style meal steamed in a pit of hot rocks. Two weeks later, over the preparation of the veges, the fires and the pits, we met about 70 people.

Hangis and barters were continued nearly every full moon, attracting more and more people with things to swap, music, drama, and happiness.

In July we decided that the gatherings could easily grow into festival proportions, and we began planning the Ataraxia Festival. Ataraxia is an old word meaning "tranquility".

That same month we were offered the orchard of 800 trees for another $10 a month ... our landlord is marvellous. With the help of voluntary workers we are growing not only fruit and vegetables for the festival, but as a community as well. You're welcome to join us now.

Ataraxia will be held on a beautiful 200 acre property down south near Manjimup, where there are forests of tall Karris, the Warren River and Smithbrook flowing right through its hills. We've taken and paid for the option on the property towards buying it, and expect a community to be established before and after the festival.

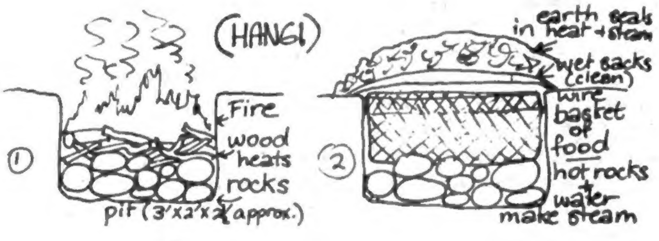
The festival will be a gathering of people of all colours, religions and lifestyles. The aim is that all barriers created by so-called "differences" be removed. If there are still such folk who distinguish themselves as "freaks" and others as "straights", then Ataraxia is not yet their place.

Everyone is expected to set up their own shelters, be they tents, domes, wiltjas, whatever, using available resources from here to there. The land is too beautiful to be disturbed by cars. Instead we will be providing bus or train service free from Perth to the site, for those who buy their ten-day tickets by mail ahead of time.

If you bring a car, parking space will be available away from the site — we hope to have a mule and cart service from there. Send a stamped envelope for information, or send postal notes and money orders to: Ataraxia Festival, C/- PO Roleystone, WA, 6111. (Phone: 95 5287.)

Because of distemper outbreaks and other problems caused by too many dogs at Nimbin, we are hoping people won't mind leaving their dogs at home during the festival.

Love, joy and peace, Tina and Bauxhau Stone, and all at Ataraxia.



Close to the Earth

Dear friends,

It's nice to be back.

This issue of EARTH GARDEN comes to you in the midst of painting walls, ripping up floors, spackling, cleaning ceilings, filling drains, remaking gardens and discovering hidden brick pathways six inches underground. Sun Cottage is coming back to life.

We hardly noticed our break from the usual routine. We've had so many letters and orders to be filled that a good part of every day was "business as usual". Still, we've managed to move to the country at last.

Lately there's been EG 11 to write, put together and lay out. But at least there's been time to race out for an hour or so of furious digging each day. So we've been able to sample garden-fresh carrots, cabbages, spinach, potatoes, tomatoes and radishes and say to ourselves: "We grew that".

There is a kind of magic in working your own piece of land. You feel closer to the earth. We're happy. Melissa loves it too. Thanks for all your kind wishes and support.

Peace and love,

Irene and Keith

The EG Book

The EARTH GARDEN Book is a guide to self-sufficiency and natural living in Australia. It's a selection of what we think were the best articles from EARTH GARDEN 1-10, covering our first three years.

For easy reference the book is divided into sections dealing with People, Food, Animals, Shelter, Growing Craft, Bees and Natural Energy (solar, wind and methane power).

Altogether there are 254 rather packed pages in the same style and format as the regular magazine issues, all contained in one cover in a permanent form.

Regular readers won't find any fresh material — that's the job of the continuing EG issues. We see the EG Book as a source book, an ideal gift for friends, and a way of getting to new readers through outlets which don't carry EARTH GARDEN.

In the future sometime it will be the only record of those ten issues as we realise that our back copy stocks won't last forever.

Our publishers, Thomas Nelson (Australia) Pty Ltd, tell us that publication has been delayed until July. We hope everyone who has already ordered from us won't be disappointed. We'll send your copies off to you as soon as they're available.

The EARTH GARDEN Book should be on sale at good bookshops from July, 1975. Or you can buy it from us by mail at $7.55, which includes postage and packing.

What's ahead in 1975?

Water as a subject spills over to EARTH GARDEN 12, out in June, with stories on aquaculture and solar desalination.

We also plan a strong shelter section and a thorough coverage of food storage and preservation (we'd like to hear your ideas and hints on keeping, drying, freezing and bottling food). Plus the usual features — land lines, letters, book reviews, sources — and what you send us.

EG 13 in September will be a "bush" issue, with all we can gather on our unique natural resource — what the bush is, living with it and taking care of it.

EG 14 will finish off the year with the accent on self-sufficiency. This will include its literature (even Robinson Crusoe!) and "useful" equipment, plans, sources and groups.

We need your help in putting it all together, so drop us a letter to our new address: PO Box 254, Lithgow, Australia, 2790.

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EG7: SOLAR 2 — HOT WATER ... YOUR OWN HEATER ... LAND ... TITLES ... MAPS ... AUCTIONS ... FLIGHT FROM THE CITY ... THE GOOD COMPANY ... LAND LINES ... ANGORA GOATS ... MULBERRIES ... COUNTRY LEATHER — MAKE A BAG & BELT ... A FUNGUS FEAST ... START A SCHOOL ... SCHOOL GARDENS ... RECYCLE A SCHOOL ... NATURAL DYES ... MUDBRICKS AGAIN!

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